

COAL AGE

SEPTEMBER, 1960

Steel Future p 76

Hydraulic Fluids p 128

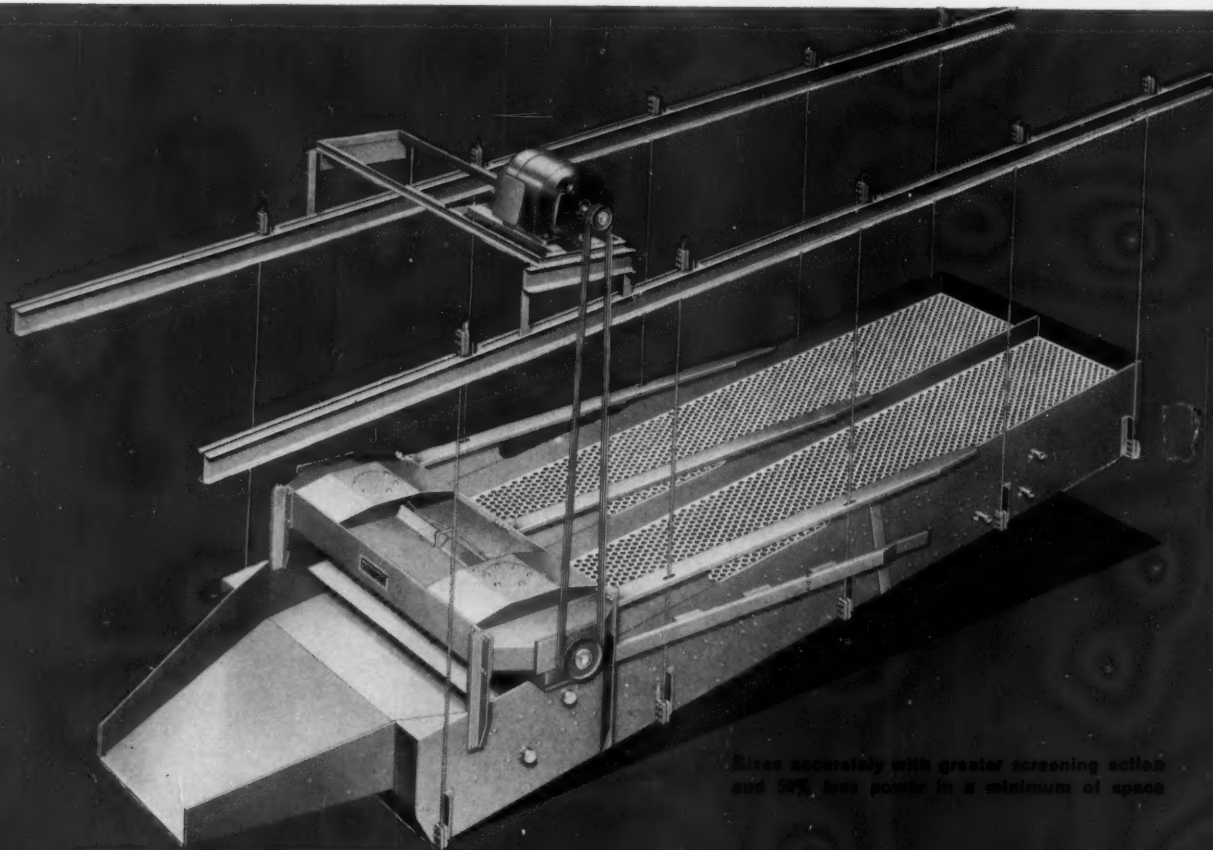
A MCGRAW-HILL PUBLICATION

PRICE \$1



Cutter and Drill Bits . . . p 109

SAVES SPACE—SAVES POWER—SAVES MAINTENANCE



*Sizes accurately with greater screening action
and 50% less power in a minimum of space*

FAIRMONT SHAKER SCREEN

WITH INTEGRAL DRIVE

**FOR COAL • GRAVEL • RUBBLE • CRUSHED
STONE • ORES • AND OTHER BULK SOLIDS**

Here's the screen that's the last word in efficiency and economy—space saving, power saving, structural maintenance saving—yes, even saving wear and tear on the facility where it is housed!

Its integral drive saves space by eliminating drive arms! Its screen and drive suspended by wire rope keeps the reciprocating forces from transferring destructive impact and vibration to the structure, preserving building life and reducing upkeep! What's more, the **FAIRMONT** Shaker Screen operates with 50% less power than most other standard units and, all-in-all, saves time and maintenance day in and day out!

Why not write us about your screening problems today. We are sure this **FAIRMONT** Shaker Screen with its integral drive will save you dollars in your profit picture. Send for Bulletin No. 6-60 on your letterhead.

FAIRMONT MACHINERY COMPANY

FAIRMONT, WEST VIRGINIA

ENGINEERS • DESIGNERS • FABRICATORS and CONSTRUCTORS



Hose drains acid pools to keep a coal mine dry

GETTING rid of pools of water that collect in this coal mine is a constant job. At first, iron pipe was used to drain the pools. But the water contains acid that eats holes in metal. Flexible rubber hose, reinforced with wire, was tried, and worked fine until it was run over several times and crushed flat by heavy mining equipment.

When a B.F. Goodrich man heard of the trouble, he recommended a B.F. Goodrich hose that springs back to shape when run over. A continuous coil of hemp rope, specially treated and buried in thick rubber, makes this hose

strong enough to stand the suction, yet flexible enough to spring back to its round shape after being crushed.

Since 1953, B.F. Goodrich water hose has worked night and day to keep this mine dry. It has gulped millions of gallons of acid water, been run over countless times by shuttle cars and other equipment. But despite the abuse, it lasts four times longer than the hose used before, saves an estimated 75% in maintenance costs.

Your B.F. Goodrich distributor has exact specifications for the B.F. Goodrich hose described here.

And, as a factory-trained specialist in rubber products, he can answer your questions about the many rubber products B.F. Goodrich makes for industry. *B.F. Goodrich Industrial Products Company, Department M-879, Akron 18, Ohio.*



SPECIAL TRACK LAYOUTS?

A Bethlehem Specialty

The drawing shown here is just a detail taken from a rather large track plan prepared for a customer by Bethlehem technicians. We have the knowledge and experience to help you with your haulage system requirements. And we also have the space to preassemble the trickier track components right in our shops to be sure of perfect fitting. You can count on Bethlehem for the most practical kind of help when you have a track problem.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

The drawing shown here is just a detail taken from a rather large track plan prepared for a customer by Bethlehem technicians. We have the knowledge and experience to help you with your haulage system requirements. And we also have the space to preassemble the trickier track components right in our shops to be sure of perfect fitting. You can count on Bethlehem for the most practical kind of help when you have a track problem.

Export Distributor: Bethlehem Steel Export Corporation

The Bethlehem Steel logo, featuring the words "BETHLEHEM STEEL" in a bold, sans-serif font, with "BETHLEHEM" on the top line and "STEEL" on the bottom line, all enclosed within a stylized I-beam shape.

THIS IS MSA: Illumination • Electronic Communication and Control • Rock Dusting and Dust Collecting • Fire Fighting Equipment • Respiratory Protection • Artificial Respiration Equipment • Personal Protective Wear • First Aid Equipment • Permanent and Portable Instruments

So much depends on unfailing light

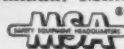
Men and machines cannot work at peak productivity without proper illumination. Poor light means unsafe working conditions. Without light there is no work, no production underground. Illumination is *that* important.

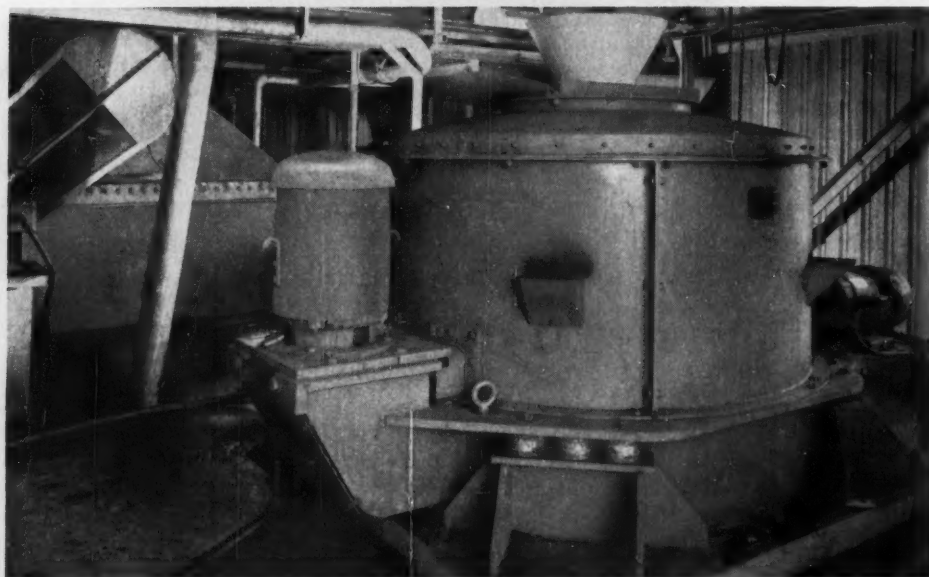
Through years of close cooperation with the mining industry, Mine Safety Appliances has developed a quality line of illumination products that put all-important unfailing light underground. And, all MSA products are backed

up by a network of sales, service and warehouse facilities.

MSA illumination products include miners' Edison electric cap lamps, permissible trip lamps and fluorescent mine lighting systems. Automatic lamp charging equipment is supplied for self-service lamphouse installations.

Contact your MSA representative for additional information. Or, write Mine Safety Appliances Company, 201 N. Braddock Ave., Pittsburgh 8, Pa. In Canada: Mine Safety Appliances Company of Canada Ltd., 500 MacPherson Ave., Toronto 4, Ont.





On $\frac{1}{4}$ " x 28 mesh AT ALLENDALE*

this BIRD-HUMBOLDT Centrifugal Dryer takes the $\frac{1}{4}$ " x 28 mesh coal and delivers *all of it* thoroughly dewatered, with almost no degradation, at exceedingly low cost per ton.

This is but one of many successful Bird-Humboldt installations which are handling up to 80 tons or more per hour, getting surface moisture down to 5% or less at an over-all cost of substantially less than 5 cents a ton.

Write for Bulletin.

**Pittsburg & Midway Coal Mining Company's Allendale Mine, Wyoming, Illinois, owned and operated by Stonefort Coal Mining Company, Inc., Indianapolis, was designed and built by Roberts & Schaefer Company and is one of the most modern preparation plants in the country.*

BIRD-HUMBOLDT Centrifugal Coal Dryer

BIRD MACHINE COMPANY • SOUTH WALPOLE • MASSACHUSETTS

Regional Offices:

EVANSTON, ILL. • HUNTINGTON, W. VA. • ATLANTA, GA. • LaPORTE, TEXAS • WALNUT CREEK, CALIF.

This Month in SEPTEMBER, 1960

COAL AGE

Features This Month:

Editorial: Rail, Water or Pipe?	p 75
Outlook: Steel and Coal	p 76
Modernization With AC Equipment Doubles Productivity at Guyan Mines	p 80
Oldest in Illinois—Kuhn Cooperative Shows How They Used to Do It	p 84
Maintenance Ideas: Hardsurfacing Guide	p 88
Development of a New Mine	p 96
Better Section Haulage Boosts Continuous Miner Output	p 102
Operating Guide: Cutter and Drill Bits	p 109
Fire-Resistant Fluids	p 128

Departments This Month:

Coal Commentator	p 11	News Roundup	p 26
Foremen's Forum	p 134	Operating Ideas	p 138
Equipment Developments	p 142		

► Coal Markets

Outlook: Steel and Coal	p 76
-------------------------	------

W. A. Raleigh Jr., Associate Editor, *Coal Age*

Top-ranking steel executives deny there is any real substance to talk that their industry has stopped growing. Steady upward movement in steel demand is much in the picture. Reviewed are: What happened to steel in the first half of 1960, how the industry sees immediate and long-term opportunities for expanding steel consumption and what it is doing to convert these to reality.

Along the Way—Competitive problems and solutions; evidence of more aggressive selling and market development.

► Deep Mining

Modernization With AC Equipment Doubles Productivity at Guyan Mines	p 80
--	------

New AC face equipment at Island Creek's Guyan mines enables 8-man crews to double the previous output of slower-loading, older DC machines. The production record now is 1,137 tons of raw coal per shift and management expects day-to-day output to range from 900 to 1,000 tons per shift. To convert face operations to AC, Island Creek made modifications to the existing AC facilities, including changing surface transformers, adding circuit breakers, installing ground-current lim-

iting resistors and extending the AC system and protective devices to the sections.

In Addition—How mining equipment is used; the AC power setup.

► A Period Piece

Kuhn Cooperative Shows How They Used to Do It	p 84
--	------

Grover Brinkman, Okawville, Ill.

Mule-powered transportation, carbide-lamp illumination and pick-and-shovel face equipment define the operations at the oldest active coal mine in Illinois. Now in its 94th season, the Okawville workings of the Du Bois Coal Co. were producing coal when Grant took Richmond. A steampowered hoist raises coal in the 300-ft shaft—and Casey Jones steamed past the tippie on the nearby Illinois Central tracks.

Expedient—A full-grown mule sits down on the cage. Otherwise the animal would not fit in the narrow shaft.

► Maintenance Ideas

Hardsurfacing Guide	p 88
---------------------	------

V. Peters, Development Engineer, The Lincoln Electric Co., Cleveland, Ohio.

Hardsurfacing is an inexpensive means of extending equipment life. It not only reduces parts cost but also keeps equipment operating efficiently and cuts downtime. This article covers metallurgy of hard-surfacing, how to analyze each job, and the proper selection and application of electrodes. It is designed to aid the experienced users of hardsurfacing materials as well as beginners.

Reward—Special hardsurfacing chart shows how good various types of electrodes are for specific applications.

COAL AGE, September, 1960, Vol. 65, No. 9. Published monthly by McGraw-Hill Publishing Co., Inc. U. S. subscription rate for individuals in the field of the publication \$3 per year, single copies \$1 (for rates elsewhere see p. 9). Executive, Editorial, Circulation and Advertising offices: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y. Printed in Philadelphia, Pa.; second-class mail postage paid at Philadelphia, Pa.

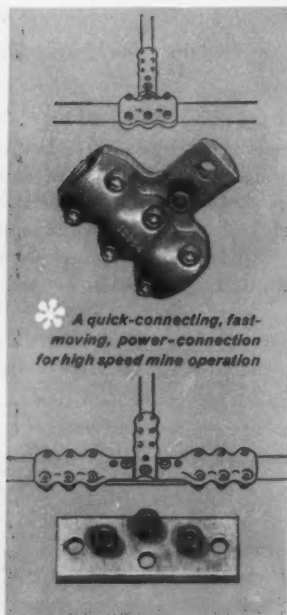
Postmaster: Please send form 3579 to Fulfillment Manager, Coal Age, 330 W. 42d St., New York 36, N. Y.

O-B Designs for Mining Men:



RESULT: you can make connections

between seven popular sizes of copper or aluminum cables . . . joining the same or different sizes . . . either copper or aluminum



** A quick-connecting, fast-moving, power-connection for high speed mine operation*

FAST . . . The new O-B Cable Connector makes or breaks a cable connection simply with the turning of two cap screws. These sturdy fittings are especially designed for sections that are picked up and moved frequently.

VERSATILE . . . You can add or remove sections of cable to keep pace with fast machinery. You can make tap-offs, 3-way connections between cables, or a variety of switch and panel arrangements . . . all in minutes!

SIMPLE . . . Your O-B Cable Connectors give you the advantages of "built-in" cable connections that hook-up or disconnect simply. No specialist needed . . . saves time and labor on the job.

Write us . . . or see your local O-B sales-engineer to order the new O-B Cable Connectors. You'll find—as others have—that they make moving easier, faster, and considerably cheaper. OHIO BRASS COMPANY—MANSFIELD, OHIO, Canadian Ohio Brass Company, Ltd., Niagara Falls, Ontario.

Ohio Brass 

EXPANSION SHELLS AND PLUGS • LINE MATERIALS • SAFETY
AND CONTROL EQUIPMENT • ELECTRIC HAULAGE MATERIALS

HOLAN

► Punch Mining

Development of a New Mine p 96

Augering supplements punch mining and also develops the property for future deep mines at the operations of Robinson-Phillips Coal Co., Baileysville, W. Va. The property now includes eight punch mines, an augering operation and a preparation plant. Mining is in the 32-36-in Douglas Red Ash seam from which a low-ash coal is produced. Equipment includes shortwall cutting machines and tractor-trailer combinations (battery-powered) for transporting the coal. The 24-in auger produces a daily average of 300 tons employing a four-man crew.

Recipe—How to plan for punch mining following augering.

► Continuous Mining

*Better Section Haulage Boosts
Continuous-Miner Output* p 102

Continuous miners now advance an additional 20 ft per shift since more efficient transportation units provide an increase in productive time. The new units consist of 36-in panel belts and Joy 18-SC shuttle cars, the latter running on six wheels and having a "hinge" section across the center. Bigger payloads and faster speeds are features of the new cars. Management reports that in hauling 85,000 tons of coal between May, 1959, and January, 1960, the only repair required on the first two trial cars was replacement of a light switch.

Major Interest—Specifications of six-wheel cars; mine layout; working methods.

► Operating Guide

Cutter and Drill Bits p 109

A positive program of selecting, applying and maintaining cutter and drill bits will lead to higher productivity and lower supply costs. This 16-p Operating Guide, third in this special *Coal Age* series, treats in detail the design features of various types of bits, special applications for particular bits, directions for rebuilding and sharpening all types of bits and how to add to bit and drilling machine life through proper drilling procedures.

Special Offering—Lists of suppliers and the types of bits they provide.

► Hydraulics

Fire-Resistant Fluids p 128

David H. Michael, Hulburt Oil & Grease Co.

Relatively low cost of water-in-oil emulsions (50¢ to \$1.50 per gal) make them most promising for mine

This Month in **COAL**

TURNING POINT—The U. S. economy still is one of seemingly illogical contrasts, with electric power output up, general business pretty good and steel still slow, as examples. But if the bituminous production curve is any indicator, things are beginning to pick up. Gains of up to a million tons a week in August bid fair to continue in September assuring a modest rise in the total output for the year and auguring a further increase in 1961—this on the assumption that the improvement in business now being experienced will continue for some time to come.

STILL DOWN FOR HARD COAL—Anthracite's big need still remains a siege of real cold weather. Without it, the drop in production continues and could leave the industry 2 million tons or more short of 1959 figures in 1960. But the fact that hard coal still offers opportunities, even if not on the old scale, is evidenced by continued investment in new production and preparation facilities. New marketing policies, such as equipment leasing, could enhance these opportunities and thus offer the possibility of halting the decline at some future date.

MARKET BY MARKET—For the rest of 1960, utility coal use should increase. Steel also should consume more coal as the steel rate rises. General industry could wind up with a standoff though the figures indicate a rise. The figures also indicate a rise for retail deliveries. Exports remain down, though some strengthening is a possibility before the end of the year as a result of changes in the situation abroad, including some reduction in swollen European stockpiles.

FUELS POLICY—With no action in the bobtailed session of the present Congress but both the Republican and Democratic platforms declaring for or endorsing the idea of a National fuels policy the chances of adoption of such a policy in the new Congress increased. At the same time oil continues its campaign against the idea, using as one of its main arguments the fact that, even though the resolution makes no mention of it whatever, adoption of such a policy would mean market allocation. And at the same time also importers and jobbers along the East Coast are intensifying efforts to get import quotas removed if possible or if not eased materially.

GO WEST?—Big coal reserves but not-so-big markets—at least in recent years—have been the story for western steam coal. But two new power plants in the New Mexico-Arizona area are an additional indication that things may be different—perhaps radically so. True, the size the industry could hope to attain would not compare with the Middle West, East or South but the trend in oil and gas prices in the Far West, as elsewhere, is enhancing utility interest in coal. Rebirth of the steam-coal industry of the Rocky Mountains already has taken place. It could reach some size in the relatively near future.

EFFICIENT...



SAFE...



STRONG...



VERSATILE...



PROVEN...



WILLISON COUPLERS

The Willison has only four moving parts.

WILLISON COUPLERS

No need for men to go between cars to couple or uncouple.

WILLISON COUPLERS

Coupler head and shank are one-piece steel casting with over 400,000 pound ultimate strength.

WILLISON COUPLERS

Used on all types of mine cars and locomotives; with accessories, can couple with link-and-pin hitchings; can be used with cables on incline haulage or odd pulling requirements.

WILLISON COUPLERS

Over 100,000 Willisons in service in the U.S. and overseas.

- Rubber Cushioned Units
- Mine and Industrial Car Trucks
- NACO Steel Wheels
- NACO Steel Links and Swivel Hitchings

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Established 1868

*Transportation Products Division
Cleveland 6, Ohio*

*International Division Headquarters
Cleveland 6, Ohio*

*Canadian Subsidiary
National Malleable & Steel Castings
Company of Canada, Ltd., Toronto 1, Ontario*

This Month in Coal Age—Cont'd

use. Usual emulsion is 40% water and 60% oil, with the water, after vaporization by flame or heat, acting as a fire-extinguishing blanket. Adding water raises fluid viscosity, contributing to such things as cutting consumption with certain emulsions to half that of oil and a different type of action in equipment. Good emulsions outperform cheap oils and can do as well as premium oils at less cost because of reduced consumption. A change to emulsion should be done in accordance with a rigid schedule designed to permit an accurate comparison of results with the oil previously used.

"Oil and Water Do Mix"—How an emulsion is formed and how it acts in service.

D. C. McGRAW Jr., Publisher IVAN A. GIVEN, Editor

Harold Davis A. E. Flowers W. A. Raleigh Jr.
Managing Editor Associate Editor Associate Editor

Daniel Jackson Jr. Richard J. Taft F. A. Zimmerli
Associate Editor Assistant Editor Art Director

G. B. Bryant Jr. W. H. McNeal
Washington Circulation Manager

GORDON A. MACK, Advertising Sales Manager

NEWS BUREAU OFFICES: Atlanta; Chicago; Cleveland;
Dallas; Detroit; Los Angeles;
San Francisco; Seattle;
Washington

WORLD NEWS OFFICES: London; Paris; Tokyo;
Caracas; Moscow; Bonn;
Mexico City; Beirut;
Rio de Janeiro

COAL AGE, VOLUME 65

SEPTEMBER, 1960, NUMBER 9

COAL AGE, with which are consolidated The Colliery Engineer and Mines and Minerals, is published monthly by McGraw-Hill Publishing Co., Inc. Founder: James H. McGraw (1860-1948).

SUBSCRIPTION PRICE: Available only by paid subscription. Publisher reserves the right to refuse nonqualified subscriptions. Subscriptions to Coal Age solicited only from executives, management, engineering, operating and supervisory officials associated with companies engaged in the mining and preparation of anthracite, bituminous and lignite coal. **POSITION AND COMPANY CONNECTION MUST BE INDICATED ON SUBSCRIPTION ORDERS.** Send to address shown in the box below. U. S. and possessions and Canada, subscription rate for individual in the field of the publication \$3 per year, single copies \$1; elsewhere \$15 per year, payable in advance; single copies \$2.

EXECUTIVE, EDITORIAL, CIRCULATION AND ADVERTISING OFFICES: McGraw-Hill Building, 330 West 42d Street, New York 36, N. Y. Telephone: Longacre 4-3000. Teletype: TWX N. Y. 1-1636. Cable address: McGRAW-HILL, N. Y.

Printed in Philadelphia, Pa.; second class mail postage paid at Philadelphia, Pa. Title (a) registered in U. S. Patent Office. (c) Copyrighted 1960 by McGraw-Hill Publishing Co., Inc. Quotations on bulk reprints of articles available on request. All rights reserved, including the right to reproduce the contents of this publication, either in whole or in part.

OFFICERS OF THE PUBLICATIONS DIVISION: Nelson L. Bond, President; Shelton Fisher, Wallace F. Trendler, Senior Vice Presidents; John R. Callahan, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising Sales; A. R. Venesian, Vice President and Circulation Coordinator.

OFFICERS OF THE CORPORATION: Donald C. McGraw, President; Joseph A. Gerardi, Hugh J. Kelly, Harry L. Waddell, Executive Vice Presidents; L. Keith Goodrich, Vice President and Treasurer; John J. Cooke, Secretary.

UNCONDITIONAL GUARANTEE: Our primary aim is to provide subscribers with a useful and valuable publication. Your comments and suggestions for improvement are encouraged and will be most welcome. The publisher, upon written request, agrees to refund the part of the subscription price applying to the remaining unfiled portion of the subscription if editorial service is unsatisfactory. COAL AGE articles are indexed by Engineering Index. Coal Age's own index is published annually in the December issue.

POSTMASTER: Please send Form 3579 to Fulfillment Manager, Coal Age, 380 W. 42d St., New York 36, N. Y.

SUBSCRIBERS: Please address all correspondence, change of address notices, subscription orders or complaints to Fulfillment Manager, Coal Age, 330 West 42d St., New York 36, N. Y. Change of address notices should be sent promptly; provide old as well as new address; include postal zone number, if any. If possible, attach address label from recent issue. Copies of publication are addressed one to two issues in advance; therefore please allow one month for change of address to become effective.

This Month in Mining Practice

LONGWALL RE-TRIAL—Logically, longwall is perhaps the ideal mining system—if roof can be controlled. Without the packwalls employed abroad, such roof control so far has not been achieved in the U. S. New trials now under way, however, employ new roof-support and control units developed abroad. If these are successful under U. S. conditions then longwall is destined for much wider use. Even if longwall should fail to make it after these new trials, there is real hope for high productivity in thin coal through the continued development of high-capacity low-coal machines.

PVC OR NEOPRENE?—It is possibly a matter of debate whether PVC brought in the plyless belt or whether, since the first plyless belts were covered and impregnated with PVC, they brought it along with them. Neoprene, in any event, is not content to let this challenge pass and as a result many solid-carcase and plied belts using this compound are being offered in competition with the PVC types. Field trials will bring the answer as to whether one or the other can achieve dominance or whether both will compete freely and continuously. Field trials also will answer the question of the eventual role of the plied belt—fewer plies, lighter and more flexible—in panel and mother service where the solid-carcase belt has made an initial and heavy showing.

SAMPLING—Successful test of an automatic coal sampler on Lakes piers could result in wider use of such equipment at receiving and transfer points, in turn perhaps putting the heat on the mines to improve their techniques and thus avoid disagreements—unless the mines are willing to let railroads and coal receivers call the tune. Accuracy with a minimum of labor should be the goals in any mine programs. Automatic equipment is the logical answer though other methods involving some hand labor can yield equally good results, both cost- and accuracy-wise. The pressure for accuracy will not get any less.

LIGHTING QUESTION—This question, being asked in several quarters, is: "Why so little progress in face and other mine lighting in spite of its advantages?" Among other things the advantages include higher output per man and a lower injury rate. Perhaps the situation may be due for a change since the USBM is looking into the situation and the possibilities. Needed, all hands agree, is more coal-operator and lighting-manufacturer interest.

MINIMIZING SIZE SEGREGATION—Size segregation in handling, storing and reclaiming coal has plagued coal producers and users for many long years. There were ways of minimizing it but usually they were expensive. Lately the problem has been tackled by working on devices to be added to bins to solve the problem with no moving parts. A recent one, which should soon be available, is almost the utmost in simplicity and does a good job. And the bins don't have to be rebuilt.



CONVEYOR BELTS



20,000 tons of washed coal per day adds up to 40,000,000 tons

This is the minimum tonnage expected to be hauled in an estimated 12-year life by the main "U. S." belt on this conveyor system.

The system is installed in U. S. Steel's Robena Coal Mine, Uniontown, Pa. Robena is actually three mines, all serviced by the same preparation plant. This combination constitutes one of the largest coal-producing units in the nation.

A single U. S. Rubber Slope Belt (installed 1953) conveys all the washed coal, amounting to over 20,000 tons a day. A second "U. S." Belt (installed in 1951) conveys coal to the blending bins.

It's top year-in and year-out performance like this that makes U. S. Rubber the world's largest producer of belts.

The belts in Robena were designed and installed with U. S. Rubber's COORDINATED ENGINEERING... the engineers of the mine, the builders of the conveyor system, and the "U. S." Belting engineers all work in coordination to produce the most efficient and economical coal-handling system.

When you think of rubber, think of your "U. S." Distributor. He's your best on-the-spot source of technical aid, quick delivery and quality industrial rubber products.



Mechanical Goods Division

United States Rubber

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

Rockefeller Center, New York 20, N. Y.

In Canada: Dominion Rubber Company, Ltd.

The Coal Commentator

AN Progress

Underwater explosion tests recently undertaken for a major producer by a major research institute apparently will throw a lot of light on the use of ammonium nitrate and particularly on the factors, including initiation, affecting its effectiveness in field use.

Pending release of the final report the two organizations have given out some tentative conclusions. The properties of the ammonium nitrate solid (density, for example) and the coating have a significant influence on energy release because of their effect on the penetration of the oil and in turn the deflagrating rate as the full oil leans down. Initiating and boosting also have a major effect on the effective energy release. In other words, the more powerful and effective the initiation the better the results.

"The tests show that by varying the boosting techniques the ammonium nitrate-fuel oil mixture can be adjusted 'to provide more of the type of energy that is desirable for the rock formation in which the explosive is being used.' "

Keystone Record

Since the trend in safety has been adverse in the early months of 1960 it is cheering to learn of the exceptions. One is the bituminous industry in the Commonwealth of Pennsylvania, which has just completed its best 6 mo in number of fatalities in the history of the Dept. of Mines and Minerals. Eleven men were killed in mining 36,542,000 tons of coal. This record also was accompanied by a healthy decrease in the number of nonfatal injuries.

A particularly interesting note on the June record is the fact that of the three fatalities in that month two resulted from the operation and maintenance of stripping equipment.

Production looks as if it was beginning to turn up, which sometimes means a rise in accident frequency. But this doesn't have to be, witness the record in Pennsylvania and the achievements of many individual mines and regions elsewhere.

Pollution Push

The heat continues to get hotter in water and air pollution. As an example, Pittsburgh and Allegheny County have adopted new and more-stringent regulations governing air pollution and the Dept. of Health Education and Welfare has a "National Conference on Water Pollution" in Washington Dec. 12-14.

One thing coal can be sure of and that is that when either air or water pollution is on the schedule it will be very much in the picture. It is not some-

thing that the industry can ignore because it is and will continue to be a prime target on both the mining and utilization fronts. The moral is that the industry should, first, keep itself informed on thinking and trends and, second, should take positive action on its own and cooperatively to reduce pollution and prevent unwise restrictions. One of the opportunities could be participation in the activities of "Cleaner Air Week," Oct. 23-29, sponsored by the Air Pollution Control Association.

Good coal motto: "Cleaner air, cleaner water at reasonable cost."

More Miners

What the continuous miners of the future will look like still is something one can no more than guess at at this time. Chances are many of them will be not too different from the types in use today. Perhaps they will be used much the same as today, though this is perhaps somewhat more of a guess than the type.

Ground for expecting that there might be some radically new types of miners reflects the continued development of different types by old-established makers and new entrants into the field. Ground for expecting that there is more likelihood of a major change in the mining plan grows out of the fact that logic dictates such a change. Longwall is, theoretically, much closer to an ideal system for continuous production than room-and-pillar—if roof control problems peculiar to the U. S. can be worked out.

Once again it can be stated that the coal mine of tomorrow may be one that operators might have a hard time recognizing.

Further Retreat

The fact that the electric utility industry in the U. S. continues to rack up new sendout records month by month, largely on coal fuel, accents once again the solidity of this fuel in this energy industry and the further retreat of nuclear power. Even Great Britain has cut back on her program, following in the footsteps of many other countries, including the U. S., even though the advocates of government development still succeed in getting some money allocated for such development. In the U.S., coal-fired plants pop up all over the place these days—from eastern Kentucky to New Mexico and Arizona, with maybe southern California, west Texas and other hitherto coalproof areas likely next.

Maybe the atom can get back into the picture, but its chances are practically nil for as far as one can see into the future. And since oil and gas prices continue to rise, and hydro prospects are few the conclusion is, once again: "Coal is king in the power field."



WESTINGHOUSE A-C EQUIPMENT HELPS SLASH POWER SYSTEM COSTS BY 30% AT THUNDERBIRD MINES

“Using Westinghouse transformers and switchhouses, we have installed one of the nation’s first major a-c deep-mine power transmission systems at the Thunderbird Mines . . . and at 30 to 35% less initial cost than with any comparable system,” reports Lester E. Briscoe, Electrical Engineer and Safety Director, Thunderbird Mines, at Farmersburgh, Ind., are operated by Ayrshire Collieries Corporation.

“Three considerations,” continues Mr. Briscoe, “influenced our decision to install the a-c power system: safety, initial costs, and maintenance.”

SAFETY—“A great benefit of our a-c system,” says Mr. Briscoe, “is its inherent safety factor. We do not fear motor flashes which could easily ignite the mine gases with concurrent fire and explosion hazards. Any malfunction of equipment is immediately tripped off the line and subsequently grounded.

INITIAL COSTS—“We do not need the costly rectifiers normal in a d-c power system, and our Westinghouse transformers were about one-fifth the cost of d-c rectifiers. The easy mobility of these units means we could eliminate tracks in the mine. We believe our power cost per ton of coal is considerably less than with a d-c power system because of very high transformer efficiency and because power losses are less.”

MAINTENANCE—“We have not had one iota of trouble with our 5-kv a-c power system, and we can readily live up to our contractual obligations to mine more than a million tons of coal a year.” A-c power equipment is simpler and has fewer moving parts than complex d-c equipment; hence, maintenance is greatly reduced.

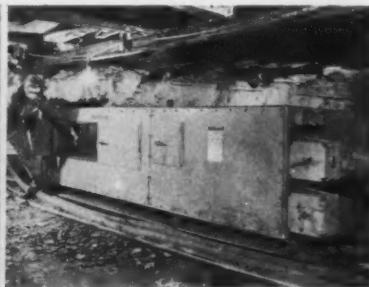
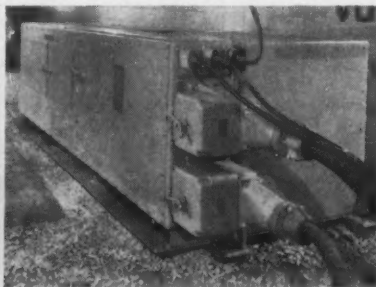
“On top of these advantages, the Westinghouse equipment is 100% more flexible than d-c apparatus. We can work farther and farther away from the voltage source with absolutely no inconvenience, holding to 440-640 volts at the working faces. We will not be forced to reset regulators to raise the voltage until we reach 8000 feet from the bore holes.”

Mining operations at Thunderbird are currently 220 feet underground, where Westinghouse equipment is strategically placed. Power is obtained from the local utility at 67,000 volts and stepped down to 4160 volts by transformers in conjunction with voltage regulators which help to hold good voltage underground. Cables running through bore holes deliver 4160-volt power through underground Westinghouse switchhouses to Power Centers which step the voltage down to 480 volts. These transformers are connected to a series of skid-mounted distribution centers which feed power to mining equipment directly at the working face and to the Westinghouse motors driving conveyor belts.

J-96151

The Thunderbird Mine is an outstanding example of a system ideal for continuous conventional operation. Westinghouse has long experience in helping coal producers achieve greater safety and continuity of service through the use of sealed-mine Power Centers. Your nearest Westinghouse representative has full particulars. Contact him, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

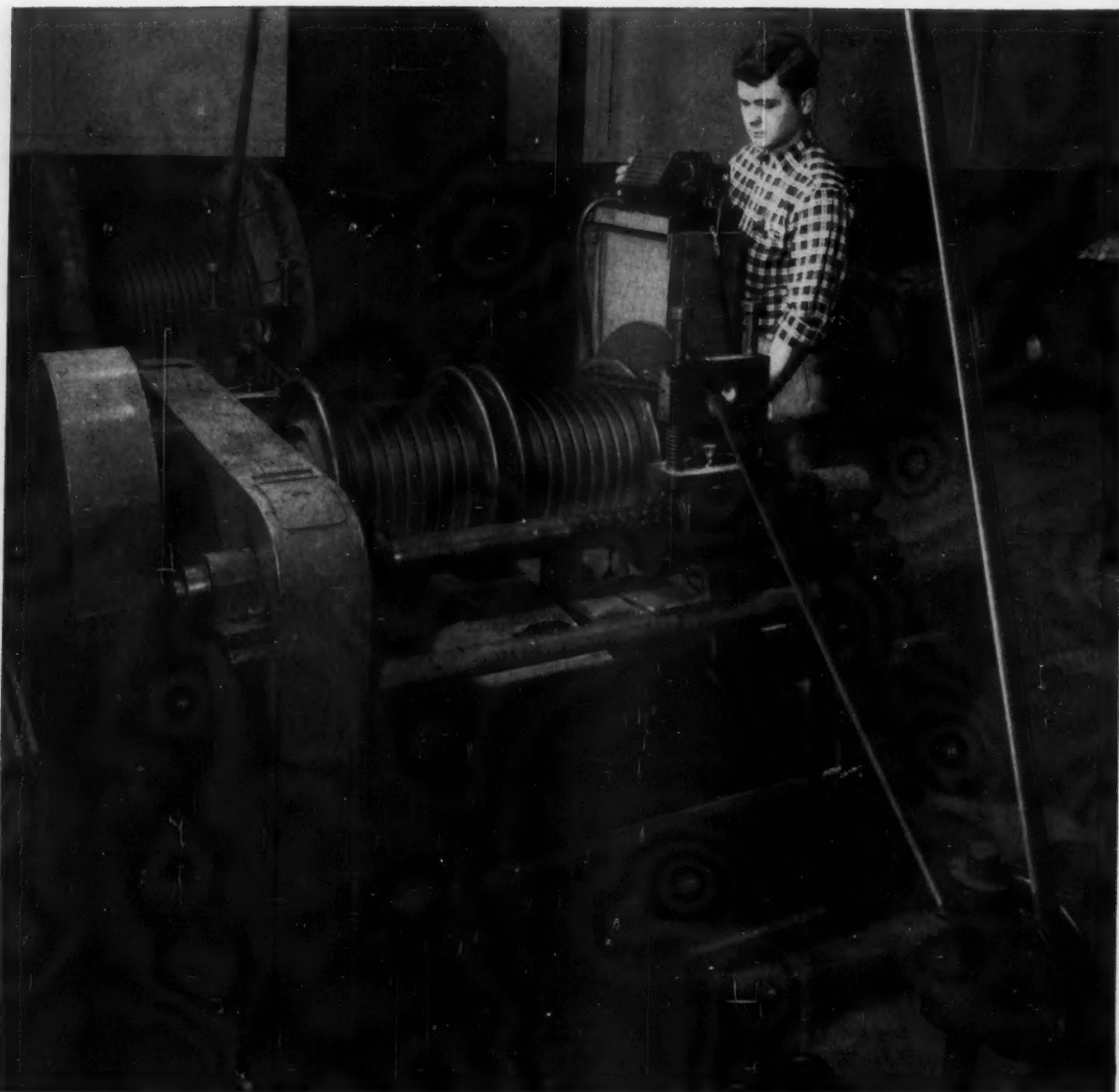
Westinghouse



WESTINGHOUSE SWITCHHOUSES in Thunderbird Mines feed 4160-volt power to Power Centers. Each unit contains one or more circuit breakers for maximum protection to men and equipment, to help minimize possibility of flashovers. Switchhouses are easily moved so power is supplied to mining equipment with little voltage loss. At left is a single-breaker switchhouse . . . above is a two-breaker switchhouse.

WESTINGHOUSE SEALED-MINE POWER CENTERS safely and reliably step incoming 4160-volt power to 480 volts. Nitrogen-filled, silicone-insulated centers are completely protected from contaminated mine atmosphere for safe, uninterrupted operation. Above center, a 300-kva Power Center serving a slope belt and auxiliary loads. At right, Chief Electrician Louis Cobb checks a 300-kva Power Center serving face machinery.

Note skid mounting for easy movement of Power Centers when necessary.



Accelerated testing of cable. This machine, designed by AS&W engineers, is testing mining machine cable to determine its resistance to reeling and pay off under tension, abrasion, flexing under tension, kinking under tension. Just one of the ways to determine the best insulating and jacketing compounds.

From portable tools to the largest power shovels, Amerclad Cables offer safe dependable service.

It's how you mix ingredients in just the right proportions that makes a big difference in cable performance. ▶



USS Tiger Brand Electrical Wire & Cable

A standard cable for every special job

- Asbestos Wire and Cable
- Mold-Cured Portable Cord
- Shovel & Dredge Cable
- Paper & Lead Cable
- Varnished Cambric Cable
- Interlocked Armor Cable
- Special Purpose Wire & Cable
- Aerial, Underground and Submarine Cable

What's the difference in electrical cable?

In **USS** Tiger Brand Amerclad it's better engineering
and quality construction

Engineered for the job. USS Tiger Brand Amerclad Cables are used in such a variety of applications that "engineering for the job" becomes extremely important. Special constructions are designed for electric shovels, dredges, mining machines, welders and portable tools. Cable life depends on how well the engineers have anticipated all the destructive forces that a cable encounters in service.

Quality construction. USS Amerclad's highly flexible construction—rubber insulated conductors and Amerprene jacket—is carefully designed to give you superior electrical performance and mechanical reliability. Dynamically balanced rope lay conductors, as opposed to loosely bunched groups of fine wires, give balanced performance and long, trouble-free service through elimination of unequal tension and elongation.

Each conductor is separately insulated with Amerite, a tough heat-resisting, special rubber compound that exceeds the requirements of ASTM, and other industry standards. A rugged abrasion resisting Amerprene jacket protects the cable from mechanical abuse.

Tiger Brand Amerclad Cables are as tough as they come. They soak up shock and vibration, withstand crushing impact, severe jerking and pulling for unbelievably long periods. Used outdoors for mining, quarrying and excavating machines, Amerclad resists the constant wear and abuse from contact with rocky

ground. And installed on lighter indoor equipment—electric welders, shop tools and motor leads—Amerclad gives top performance even when it's dragged over rough floors, through oil, grease or water.

Amerclad's greater durability will pay for itself many times in unfailing service, and ability to handle rated loads. It's the toughest electrical cord and cable money can buy.

Send for catalog. The Tiger Brand Amerclad Cable story is told completely in our new book we've reserved for you. We'll send the book without cost or obligation. American Steel & Wire, Dept. J-1, 114 Superior Avenue, N.W., Cleveland 13, Ohio.

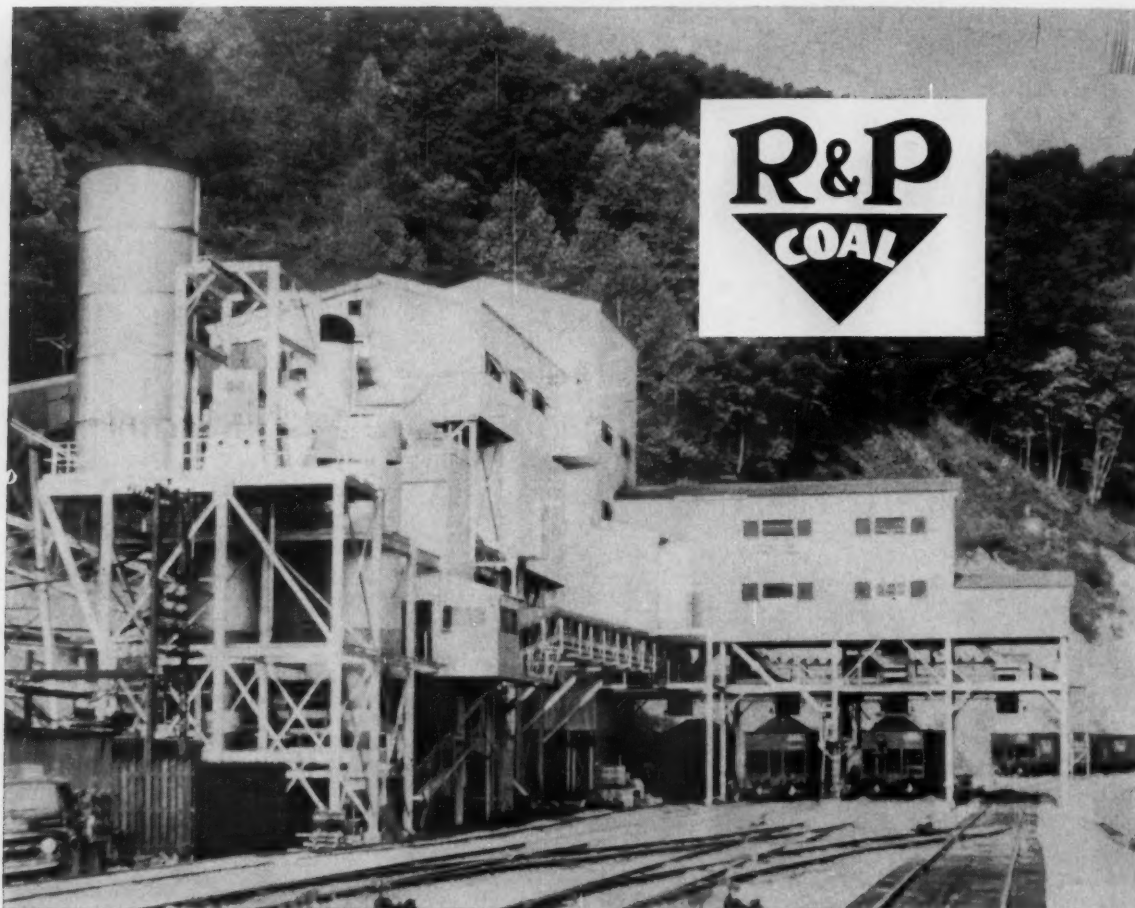
USS, Amerclad, Amerite, Amerprene and Tiger Brand are registered trademarks



**American Steel & Wire
Division of
United States Steel**

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, Distributors Abroad





Rochester & Pittsburgh Coal Company's O'Donnell Mine No. 2
Preparation and Thermal Drying Plant for 400 TPH of 5" x 0 Coal.

3 Compartment—8 Cell Air Operated Jig, H & P Cyclones,
Reineveld Fine Coal Dryers,
Vacuum-Filter and H & P Fluid Bed Dryer.

GOOD, CLEAN COAL FROM R&P COAL COMPANY

The new Coal Preparation Plant at O'Donnell Mine No. 2 is operating satisfactorily after an exceptionally short breaking-in period. Good results and smooth operating conditions were expected by Rochester & Pittsburgh Coal Company's management when they decided to install many of the products of Heyl & Patterson's research program for advanced coal preparation machinery and processes.

The Rochester & Pittsburgh Coal Company says:

"The flexibility built into this plant is already paying off. Even with fluctuating feed conditions, the product is low in ash and moisture. As a result, unexpected marketing opportunities have opened up."

Discuss your new coal preparation requirements with H & P engineers whose experience is at your disposal to conceive a preparation plant best suited to your own operating and marketing conditions.

Whether you require a turn-key job or prefer a cooperative effort—remember:

When Experience Counts... Count on Heyl & Patterson



HEYL & PATTERSON inc.

55 FORT PITT BLVD., PITTSBURGH 22, PA. • COUN 1-0750

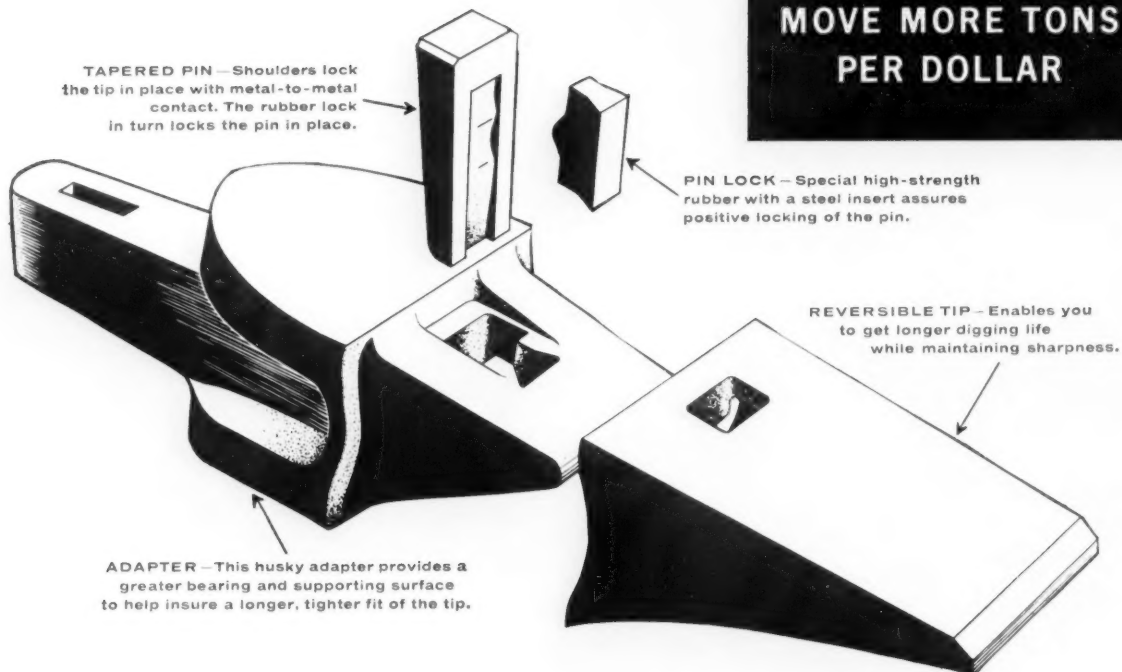


Hulburt

OIL & GREASE COMPANY

Philadelphia 34, Pennsylvania

**AMSCO HELPS YOU
MOVE MORE TONS
PER DOLLAR**



AMSCO CAST MANGANESE STEEL DIPPERS
Installed as original equipment on many leading makes of power shovels. Cast of manganese steel—"the toughest steel known"—a material which provides as much as a ten-to-one advantage in lasting power over other steels, under the abuse of severe impact and abrasion. Sizes from $\frac{3}{4}$ cu. yd. to 9 cu. yd. capacity.



AMSCO HARDFACING FOR BUILD-UP AND REPAIR—Add extra service life at low cost to dippers, dipper teeth, hammers, augers, etc. . . with AmSCO Hardfacing. Complete line of hardfacing electrodes available through your AmSCO welding distributor. Or write us for condensed catalog and price list on "AmSCO Hardfacing Alloys".

AMSCO SIMPLEX* 2-Part Dipper Tooth extends digging life stays sharp • easy to replace

Now you can save hours of costly shovel downtime . . . by using this new AmSCO Simplex 2-Part Tooth. Simplex tips are quickly reversible to give added tip life while retaining sharpness. And when teeth eventually become worn, just knock out the retaining pin and replace with a new tip.

Simplex adapters fit this new 2-part tooth to *any* AmSCO dipper or backhoe. And because AmSCO makes both dippers and dipper teeth, you can be sure of proper fit between the adapter and shovel lips.

Cast of a new alloy especially developed for this service, the AmSCO Simplex design is backed by over 50 years of experience in producing dippers and dipper teeth for the most rugged digging conditions.

Ask your power shovel distributor to supply you with these extra-long-wearing Simplex 2-part teeth . . . now!

WRITE US for complete descriptive bulletin on AmSCO Simplex teeth, giving information on sizes and types available.

*Patent No. 2,904,968



AMSCO

American Manganese Steel Division • Chicago Heights, Ill.

Other Plants in: Denver • Los Angeles • New Castle, Dela. • Oakland, California • St. Louis

In Canada: Joliette Steel and Manitoba Steel Foundry Divisions

Welding products distributed by Canadian Liquid Air Co., Ltd.

coming and going

every
you take your profits on ~~the~~ run

with the **Lee-Norse**

BUS & JITNEY



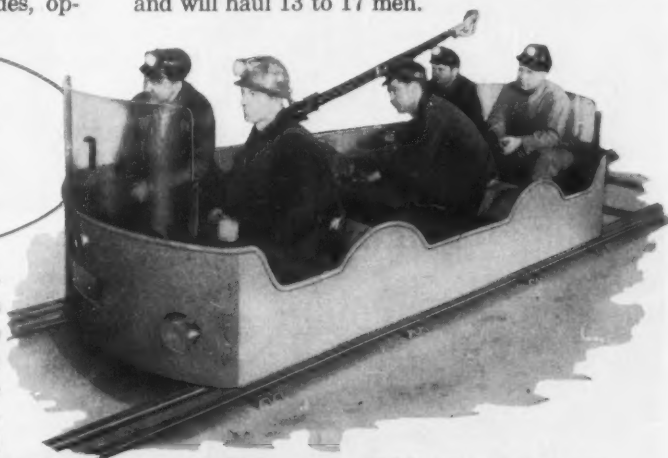
Lee-Norse
MINE PORTAL BUS

■ There's no wasted motion with this self-propelled Portal Bus because it is fast on the take-off, saving manpower time for conversion into more tonnage. And it is designed for safety, with hydraulic operated running brakes plus mechanical emergency and parking brakes direct on the wheels. For severe grades, op-

tional electric dynamic system produces braking effect from the motor for *extra* safety under all conditions. Also the split roof construction gives operator unimpeded, all directional view, while the trolley pole is always within quick reach. This bus is powered by 15 H.P. motor and will haul 13 to 17 men.

Lee-Norse
MINE JITNEY

■ The Mine Jitney is the "Jack-of-all-Trades" of the mine fleet because its versatility enables it to be used on the regular job and for emergency. It can handle the job of furnishing fast, safe transportation of key personnel, maintenance crews and special groups; and can double up as an ambulance or fire-fighting equipment car. Designed with twin braking systems for added safety. Powered with either



5 or 7½ H.P. motor. Holds up to 7 men comfortably. Optional equipment: Plexiglas windshield, fire extinguisher, stretcher equipment.



Lee-Norse Company

CHARLEROI, PENNSYLVANIA

SPECIALISTS IN COAL MINING EQUIPMENT

FOR THE RIGHT COMBINATION ON YOUR NEXT SHOT...

WHICH

when you
use the right
combination
of explosives,
blasting agents,
and blasting
techniques, all
your equipment
moves in sooner...
works faster...
produces more.

STRIPPING



PELLETS, a new form of ammonium nitrate developed by Atlas, are porous, compact particles that have both the density and sensitivity required for efficient AN-oil blasting.



KOLMITE is an economical dynamite specially developed by Atlas for shooting coal in strip operations where the coal must be blasted for easy, efficient digging.



GIANTITE, a pre-mixed ammonium nitrate blasting agent, eliminates the need for troublesome on-site mixing. Well balanced mixing assures you of complete, efficient detonation.



GIANT "75" PRIMERS and **SUPER "G" BOOSTERS** have the wallop required to assure complete, efficient detonation of both field mixed and plant mixed blasting agents.



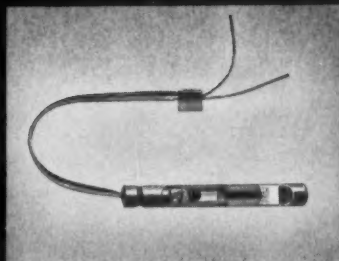
JETLOADER, introduced in 1958, is the first high capacity pneumatic blow-loading machine. Has non-sparking cast aluminum body. Mixes and loads 80 lbs. of AN in few seconds.



AMOCORE is a mixture of ammonium nitrate and carbonaceous material, packed with a waterproof gelatin core. It is available in a wide range of diameters and velocities.

EXPLOSIVE?

UNDERGROUND



KOLMASTER® millisecond delay electric blasting caps achieve the staggered action so important in producing uniform breakage and control in multiple hole shooting.



COALITE® and **GELCOALITE** permissibles are now available from Atlas in a revised range of strengths and velocities to give best performance in all underground conditions.



FEMCO 20-shot permissible blasting machine has been specially designed for use in multiple hole shooting underground. Also, it is approved by the U. S. Bureau of Mines.

Whether you are stripping coal or mining it underground, one fast road to lower operating costs is thru better use of explosives and blasting techniques. Mine operators are finding that their lowest true blasting costs depend on determining which explosives, and which blasting methods, combine to give the most uniform fragmentation, the best displacement, and the lowest overall cost.

Atlas alone offers a complete line of explosives, blasting agents (including all forms of ammonium nitrate), and blasting supplies. They are designed to provide every possible combination to meet each type of blasting problem, over a wide range of conditions. In addition to being backed by this complete line of products, your Atlas Representative can help you with newly developed blasting methods and the very latest techniques.

In coal stripping, for example, one new method that has been tried and found extremely successful is called explosives stripping, and employs Rockmaster millisecond delay electric blasting caps to gain greater throw of material. Using this new technique, one strip mine near Pittsburgh has been moving more than 45% of the overburden to the spoil pile. With bottom detonation, the rock sweeps across the pit and onto the spoil pile, requiring no mechanical handling. Beside uncovering 30 to 40% more coal in a given length of time, they also credit this new method with extending the operating life of their equipment, cutting maintenance costs, and reducing bulldozer reclamation time.

In underground coal mining, the use of Kolmaster millisecond delay electric blasting caps for multiple hole shooting is rapidly increasing. Greater safety is provided by this method, particularly in lessening the hazards of roof falls and easing the work of the shot firer. Although standard blasting procedures must be changed, and care must be exercised to be certain all state regulations are met, this new method warrants careful consideration. In addition, permissibles are being made safer with formulas containing greater percentages of salt to guard against explosions due to improper loading.

These examples are typical of the advancements being made in blasting technology. Ask your Atlas Representative about these new developments, and about the many products in the complete Atlas line. Working with him, you can determine the combination of explosives, blasting agents, and particular blasting methods that will be most profitable for you on every shot.

There is only one way to look at explosives costs, and that is: which explosive will give you the most payload service from all your equipment? Our blasting cost chart, slide rules, and technical literature are designed to help you do just that. Be sure to ask your Atlas Representative about them . . . or, write directly to:

ATLAS POWDER COMPANY
Explosives Division, Wilmington 98, Del.



ATLAS EXPLOSIVES

17,122.05 TONS

in Hazard #7 Seam



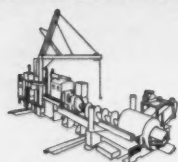
"We auger mined 17,122.05 tons of coal in October, 1959, with our McCarthy Coal Recovery Drill," says Stamper Collins. "We averaged 95 tons per man per shift as opposed to 13 tons in deep mining. We've had less than four days downtime due to mechanical troubles in more than two years."

Stamper Collins is an old, long-established user of Salem Tool equipment. He has produced as much as 64,967.90 tons of coal in five months. Like most Salem customers, Collins works his drill 'round the clock in all kinds of weather. He stops only for once-a-week servicing and maintenance.

These heavy, rugged, powerful units move from hole to hole under their own power on hydraulic skids. No extra 'dozer required. And they work close to the face—even on an inside curve of the highwall. Salem-built McCarthy recovery drills load from either side. You need only a two-man drill crew.

If BIG TONNAGE at low cost is important to you, get the facts on Salem's McCarthys today. Initial investment is less; pit-to-pit moves faster; set-up quick. Add it up . . . augered coal costs less with a McCarthy!

TWO-MAN OPERATING CREW adds new auger quickly. This Model 1500-30-36-42 has faster carriage travel and greatly increased horsepower. Built-in conveyor speeds loading.



SALEM TOOL COMPANY

763 SOUTH ELLSWORTH AVE. • SALEM, OHIO

IN ONE MONTH

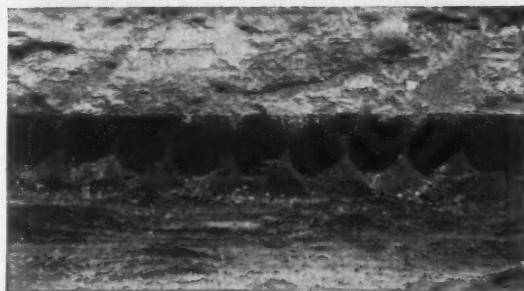


ABOVE—DRILL OPERATES at top speed even on this narrow, wet bench. Self-moving, heavy-duty hydraulic skids float drill over soggy earth. Individually operated jacks quickly set drill for best angle.

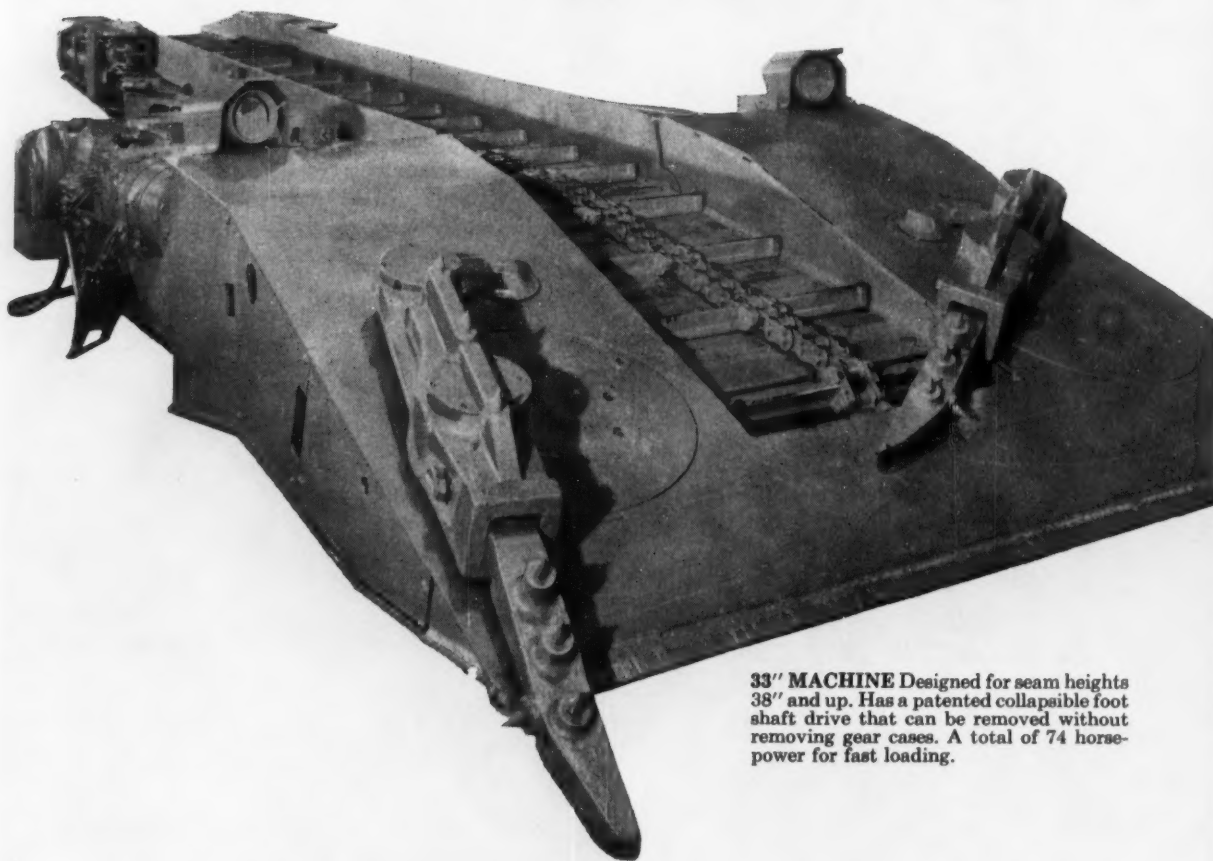


TOP RIGHT—LUMP SIZE can be controlled with Salem cutting heads. Salem operators have ready markets for their high quality coal.

RIGHT—EVENLY SPACED HOLES show ease and accuracy of auger placement. Drill can move just a fraction of an inch if desired! You mine maximum amount of coal.



NOW... A COMPLETE LINE OF JOY 14



33" MACHINE Designed for seam heights 38" and up. Has a patented collapsible foot shaft drive that can be removed without removing gear cases. A total of 74 horsepower for fast loading.

Joy's new line of 14BU-10 loaders is a family of high-production models that fits every mining condition. All have the same basic design—built for production, dependability and ease of maintenance. They have "swing-out" electrical panels for easy access to electrical controls. Each gear case is easily removable as a unit. Motors, hydraulic pump and other mechanical elements are all mounted on the outside of the machine for easy inspection and maintenance. There are no shifting clutches, torque converters or complicated linkages.

The 14BU-10's load faster because they have a wider loading head and a controlled gathering arm speed of 50 RPM (no "egg-beater" action) tied to loading tram speed. A straight through conveyor, thirty inches wide, loads out the largest lumps with

ease. Tramming is fast because of a simple two-speed system. Two 15 hp motors run in series for slow tramming; in parallel for fast tram.

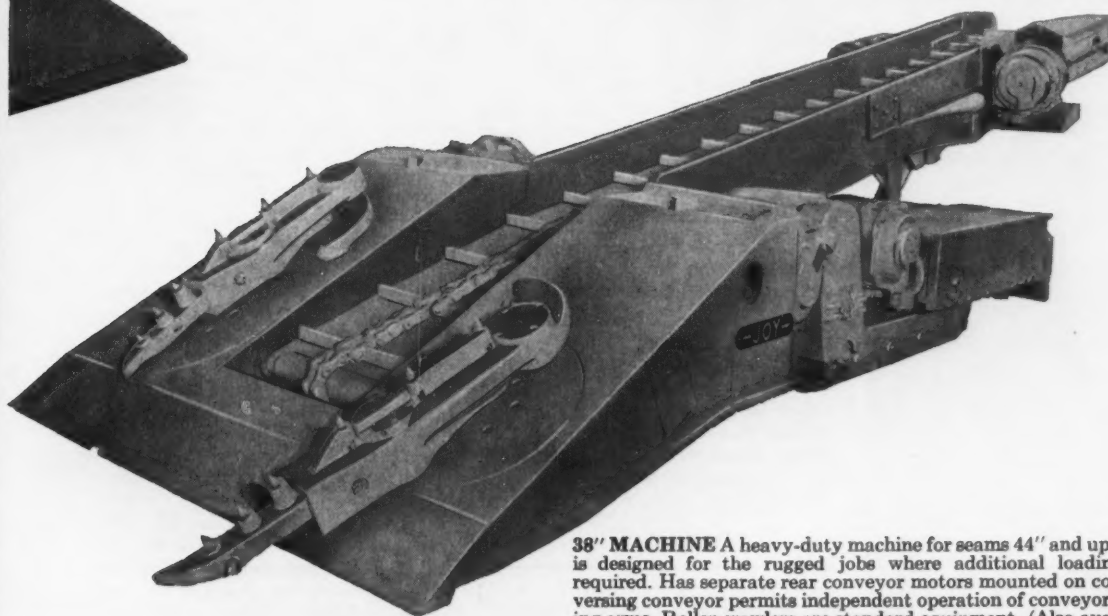
Ground clearance is never a problem because of a unique design feature. The box frame type chassis has been eliminated by placing two solid shaft members as cross ties between the crawler frames. Coal cannot accumulate under the conveyor. The absence of chassis frame eliminates chance of dirt build-up. Weight ordinarily used in a box frame is now centered over the crawlers.

Every model of the 14BU-10 has all these features; is designed to load more coal with less maintenance. Your Joy engineer has complete information on the 14BU-10, and can help you choose the proper model for your operation. Or write for Bulletin 1217-1.

BU-10 LOADERS



24" MACHINE A really low machine with high capacity; loads 10 to 12 tons per minute. Has a conveyor pan line only 14 inches high, the lowest in the industry, for loading out large lumps in seams as low as 28 inches. (Also available with a 24" wide conveyor—loader 6 inches narrower.)



38" MACHINE A heavy-duty machine for seams 44" and up. This model is designed for the rugged jobs where additional loading power is required. Has separate rear conveyor motors mounted on conveyor. Reversing conveyor permits independent operation of conveyor and gathering arms. Roller crawlers are standard equipment. (Also available is 38" machine without separate conveyor motors.)



WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING MACHINERY

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company
(Canada) Limited, Galt, Ontario



News Roundup

Coal Producers North of the Border Survey Their Woes

Coal Operators in Alberta, Canada, are hopeful they will be able to pull themselves out of a deepening financial hole.

The producers are not worrying about long-term prospects. The main problem now is to maintain a sound nucleus of operation and avoid being squeezed out by competitive fuels.

Coal production in the Alberta province has dwindled to less than 15% of the 17,000,000 tons of recoverable reserves. Profit margins of four of the major Alberta producers, including the Canmore Mines, Coleman Collieries, Lethbridge Collieries and West Canadian Collieries, have dropped to less than .05% for each ton of marketable coal produced. Several have experienced losses.

Last year Alberta produced 2,548,517 tons, including 1,214,353 strip mined and 1,300,000 tons of underground coal. This represents a hike of 29,578 tons over 1958.

This year, despite a 500,000 ton order from Japan, production is expected to remain about the same. As one Alberta coal official put it, "Another half million ton coal order would go a long way to stay above a depressed economic situation in our industry."

Dieselization of railways and heavy in-

roads into traditional coal markets by alternative fuels have been two principal reasons for the deterioration of the Alberta industry. Price competition from liquid and gaseous fuels, increased cost of operation at the pithead and transportation costs also have contributed to the plight of the industry. The cost of moving coal by rail over 600 mi is 3.8c to 5c per million btu's per 100 mi compared to 1.8c to 5c per million btu's per 100 mi for natural gas.

Miners wages take up between 50% to 60% of the operational costs. Average wage plus benefits per 8-hr shift have risen from \$12.88 in 1950 to \$18.10 last year. According to Dominion Bureau of Statistics figures, there were 2,763 miners employed in Alberta and British Columbia last year compared with 11,113 during the 1949 production peak.

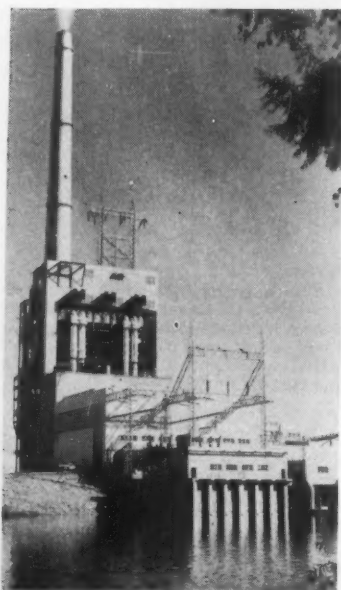
Federal government subventions (up to \$4.50 per net ton) for coal export have helped operators in western Canada to compete with other countries. Coal export to Japan is an example. But this is not quite enough. Coal operators state that subvention provisions should be such as to move the most coal for the least money. The answer is volume and, in some instances, subsidization of coal to

enable it to compete with other Canadian produced fuels. They suggest that as the price of natural gas increases the competitive gap will be narrowed and in future years should result in substantial rebuilding of the coal market in industrial heating and steam raising field.

What about the longer-term view? Coal operators say there are several grounds for optimism: first, the sheer size of western coal reserves (Alberta and B.C. have 74% of Canada's total coal reserves, equivalent to 800 trillion cu ft of natural gas); second, the present and future relative costs of coal, petroleum and natural gas.

There are several areas where coal is competitive with natural gas. One is the field of power generation where, operators state, strip coal is being produced at prices equivalent to natural gas at 12c per 1,000 cu ft or less.

The principal market for western coal in the future is likely to develop in the field of electric power generation. Most of the low cost hydro sites close to load centers in Alberta have already been developed and future power generating installations are expected to be based on coal and built close to producing mines.



Biggest Power Unit

Indiana & Michigan Electric Co., subsidiary of American Electric Power Co.,

has officially put into operation its giant 475,000-kw turbine-generator at the new single-unit Breed Plant, in Sullivan County, Ind.

Said to be the world's largest electric power generating unit, the plant is capable of fulfilling the electric requirements of more than a million average American homes, according to the company. The plant is located on the east bank of the Wabash River, about 20 mi southwest of

Terre Haute. It is tied into the I&M and AEP power systems by a 186-mi, double-circuit 345,000-V transmission line extending to a new substation west of South Bend, Ind. Total cost is estimated at better than \$71.5 million.

Philip Sporn, president of I&M and the parent, AEP, emphasized that the plant's single unit not only is the largest in the world from the standpoint of capacity, but is expected to be the most efficient power producer ever built. Design calculations and expectations are that the unit will have a thermal efficiency represented by the consumption of 8,535 Btu per kwh. Its thermal efficiency would thus be 40%. This compares to the nation's most efficient plant which requires 9,093 Btu per kwh, according to the latest Federal Power Commission reports.

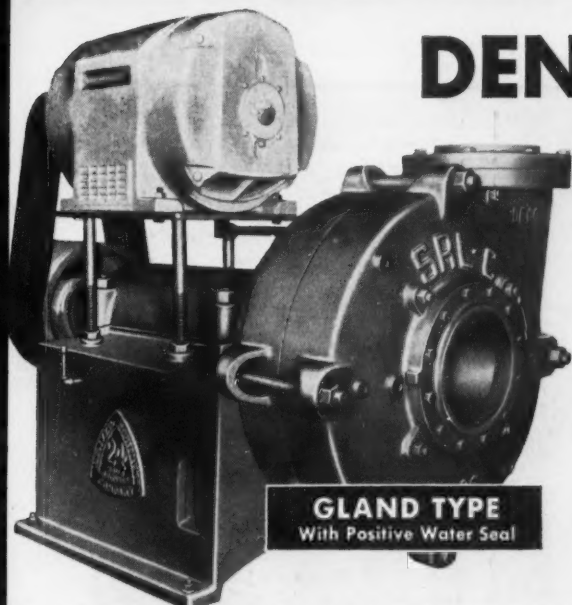
The plant is expected to burn 1.4 million tons of coal a year, all of which is to be supplied by Ayrshire Collieries Corp., Indianapolis, under a 15-yr contract. Ayrshire developed its new Thunderbird mine nearby for this purpose and built a private 6-mi railroad to connect the mine and power plant. The rail line is tied in with the Chicago & Eastern Illinois R.R. by a spur track.

IN THIS SECTION

People in Coal	p 32
Current Coal Patents	p 40
Equipment Approvals	p 42
Coal Abroad	p 44
Production Figures	p 50
Preparation Facilities	p 54
Coming Meetings	p 54

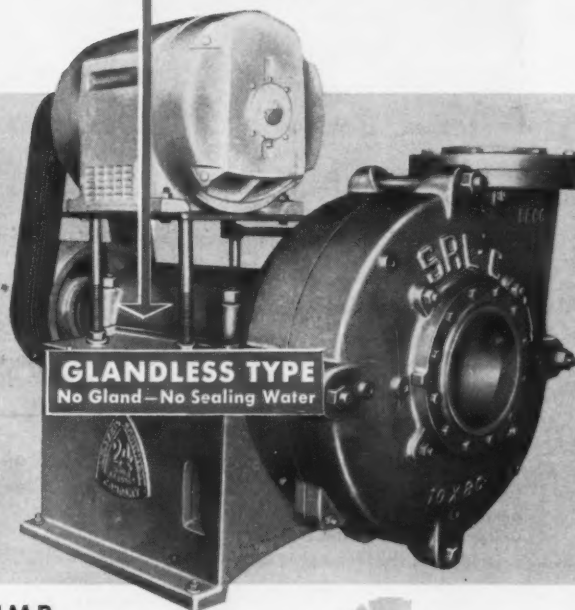
DENVER SRL PUMPS

Now available in
TWO Models



GLAND TYPE
With Positive Water Seal

FOR AN EVEN
WIDER RANGE OF
PUMPING APPLICATIONS



GLANDLESS TYPE
No Gland—No Sealing Water

AVAILABLE IN THESE SIZES AND CAPACITIES

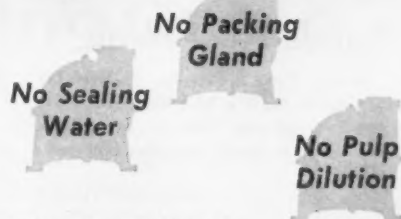
Specifications and Dimensions

Pump Size and Type	Capacity 60' Head		*Water GPM	Dimensions (In.)			Approx. Ship. Wt. Lbs.
	RPM	HP		L	W	H	
GLAND TYPE							
1½"x1¼"	2190	1.9	40	25	17½	26	525
2½"x2"	1500	4.9	160	25½	17½	26¾	575
3" x 3"	1400	6.8	260	31¼	19¾	31½	850
5" x 3"	1060	17.4	800	37¾	26¼	36½	1550
6" x 6"	1170	36.3	1600	45¼	28½	46½	2300
3" x 3"—C	1450	8.2	260	37½	21½	33¾	1240
5" x 4"—C	1035	12.6	700	40¼	27	37¾	1600
8" x 6"—C	920	39.8	1600	63	36½	49¼	4375
10" x 8"—C	820	74.0	3300	68¾	43	57	5100
12" x 10"—C	615	115.0	5000	69¾	46½	63	5900
GLANDLESS TYPE							
3" x 3"—C	1450	10.0	180	37½	21½	33¾	1240
5" x 4"—C	1035	13.0	500	40¼	27	37¾	1600
8" x 6"—C	920	47.0	1200	63	36½	49¼	4375
10" x 8"—C	820	87.0	2700	68¾	43	57	5100

*Based on water. Multiply horsepower by specific gravity of pulp to obtain actual brake horsepower.

DENVER "TRU-GLANDLESS" SRL PUMP... A MAJOR ADVANCE IN PUMP DESIGN

DENVER SRL Pumps with positive water seal already have a world-wide reputation for their high efficiency, low part cost, long life. If dilution of pulp or slurry is a problem, you now get the extra advantage of "TRU-GLANDLESS" construction. Requires no sealing water, no packing glands, eliminates pulp dilution.



SEND DETAILS OF YOUR PUMPING PROBLEMS TO DENVER

Complete Mineral Processing Equipment

"The firm that makes its friends happier, healthier and wealthier"



JAW CRUSHERS



STEEL-HEAD MILLS



SRL PUMPS



AGITATORS



"SUB-A" PLATATION



DISC FILTERS



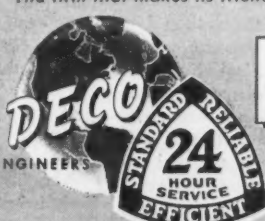
DIAPHRAGM PUMPS



AUTOMATIC SAMPLERS



DRYERS



Cable DECO DENVER

1400 Seventeenth St.

DENVER

EQUIPMENT COMPANY

Phone CHerry 4-4466

Denver 17, Colorado

- **NEW YORK CITY**
4114 Empire State Bldg.
Phone CH 4-6510
- **BLUEFIELD, W. VA.**
P.O. Box 1536 • Phone Davenport 5-6598
- **TUCSON, ARIZ.**
3437 E. Comden St. • Phone East 6-7282
- **LONDON**
15-17 Christopher St., Finsbury Sq.
Phone Bishopsgate 3375
- **JOHANNESBURG**
Broadway and Ninth
Bez Valley • Phone 25-7531
- **TORONTO**
185 Bay Street
Phone EMpire 3-8836
- **VANCOUVER**
802 Credit Foncier Bldg.
Phone MUtual 3-7595
- **MEXICO CITY**
Avenida Juarez 14, Desp. 615
Phone 21-1477
- **LIAMA**
Marquinarías 270
Casilla 4950 • Phone 41887



Coal Execs Offer Assistance

IN RESPONSE to a request from the Government of India, the Dept. of State is sending a team of three top U. S. coal mining executives to advise that country in developing a program for expansion of its coal production. The team consists of Raymond E. Salvati, president, Island Creek Coal Co., Huntington, W. Va., designated trip leader; Herbert E. Jones Jr., president, Amherst Coal Co., Charleston, W. Va.; and Edwin R. Phelps, president, Pittsburg & Midway Coal Mining Co., Pittsburg, Kan. Seen preparing for departure are (left to right): B. C. Saunders, assistant to Mr. Salvati; Mrs. Salvati; Mr. Salvati; Mr. Jones; Mrs. Phelps; and Mr. Phelps.

Provision was made in the plant's design for the eventual construction of a second 475,000-kw unit. Likewise, provision was made in the coal contract for a doubling of the fuel supply at that time.

Builds New Mine

Stonega Coke & Coal Co., Philadelphia 9, plans to build a \$4 million coal mine and cleaning plant near Big Stone Gap, Va., where it already has other coal operations.

The new mine will tap the Taggart seam, core drillings showing 20 million tons of coal in the seam adjacent to the chosen site, with another 39 million tons available. More than \$100,000 has been spent in proving the Taggart seam.

Stonega, headed by E. B. Leisenring Jr., is preparing specifications for bidders, with contracts expected to be awarded by November 1. Completion date is set for June, 1961.

The cleaning plant will have a capacity of 450 tph and will contain the most modern coal cleaning equipment available. The mine will be fully mechanized and have belt haulage, notes the firm.

Considerable stripping and auger hole mining are expected to be developed in the area as well.

The cleaning plant, to be built at the Glenbrook colliery, in Harlan County, near Keokee, Va., will have a 300-tph capacity. Employment is expected to be about 200.

Ask Funds

The Administration has asked the Senate Appropriations Committee to include an appropriation of \$1 million for the Office of Coal Research in the House-passed appropriations bill for mutual security.

The Administration's witness, Royce A. Hardy, Assistant Secretary of the Interior, told the committee that the million dollars would be used to organize immediately the Office of Coal Research, supervise and monitor the research contemplated, and establish advisory committees to help select projects that will best meet the objectives of the coal research bill passed by Congress this year.

Mr. Hardy pointed out that the funds requested were deemed to be sufficient to meet the immediate requirements of

instituting the coal research program, and that supplemental appropriations would be requested at the convening of the next congress in January, as such need is demonstrated.

He emphasized that the projects selected would be those showing immediate promise of developing new and more effective uses for coal, expanding present uses, reducing the cost of coal production and distribution and providing the most immediate economic assistance to the industry.

Agree on Plans

Plans are taking shape for a multi-million dollar steam-electric power plant on a Navajo Indian reservation near Shiprock, N. M. Proposals for development and operation of the project have been approved by the Navajo tribal council, Utah Construction & Mining Co. and Arizona Public Service Co., and have been forwarded to the United States Interior Dept.

Agreement between the three parties ends a long and tangled negotiation covering construction of the plant on reservation land, wholesaling of energy to the Navajo's and guarantees to Arizona Public Service as to its operating rights.

If the proposals are approved by the Interior Dept., Arizona Public would build a coal-burning 350,000-kw electric generating plant on the reservation 10 mi southeast of Shiprock. Fuel for the plant would be mined and furnished by Utah Construction from 24,320 acres of undeveloped tribal lands. The lands, containing large reserves of sub-bituminous coal, have been leased to the company by the tribal council.

To be known as the Four Corners Power Plant, the facility would be built on a 1,250-acre site also leased from the tribe. It would be connected to Arizona Public's system by transmission lines extending into Arizona. An estimated capital investment exceeding \$100 million would be involved in the initial development of the plant and transmission facilities.

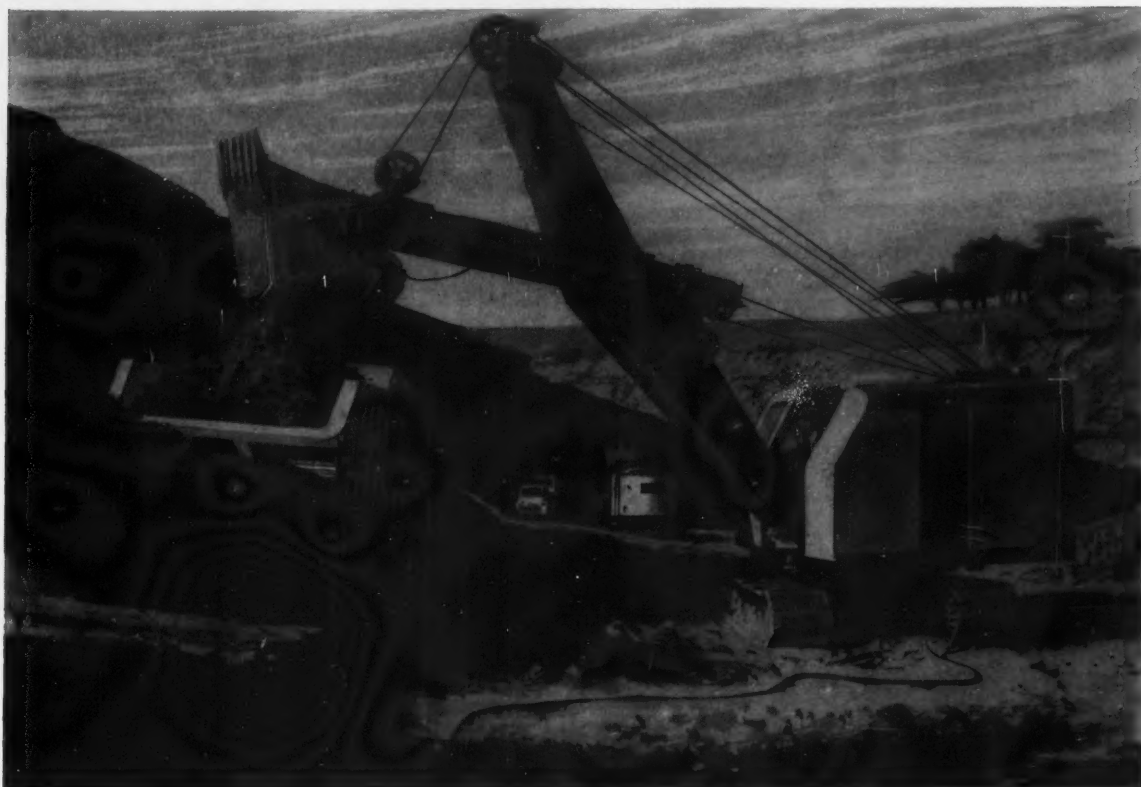
Work on the two 175,000-kw generating units planned for the first stage of the development would begin after approval of the proposals by the Interior Dept. with about 30 mo required for completion. Utah Construction's development of modern coal-mining facilities would begin at about the same time.

New Coke Oven

New York Mining & Mfg. Co., New York, is building a 200-unit non-recovery coke oven installation at Calvert City, Ky.

(Continued on p 56)

SELECT THE CABLE MADE BY THE FAMOUS "MINE-TO-MARKET" FAMILY...



Phelps Dodge Mining Cable

- Made of highest quality copper from Phelps Dodge's own open-pit mines.
- Combines years of Phelps Dodge mining "know-how" with many years of cable manufacturing experience to give you the finest quality cable you can specify.
- Assures utmost protection against damage from mechanical and electrical hazards in both above and below ground mining operations.
- Listed by the U. S. Bureau of Mines, and approved by the Department of Mines, Commonwealth of Pennsylvania, P-114-BM.

First for Lasting Quality—from Mine to Market!

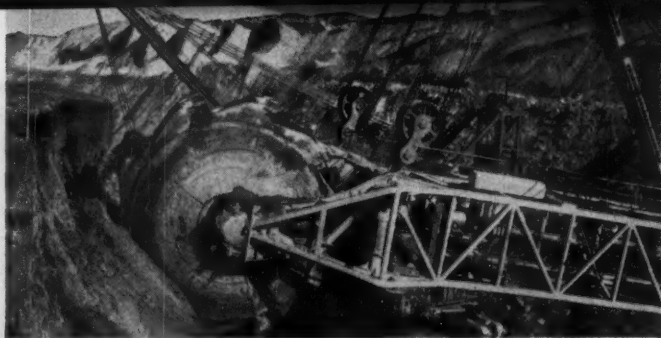
PHELPS DODGE COPPER PRODUCTS

CORPORATION

300 Park Avenue, New York 22, N. Y.



Kolbe wheel moves 3,500 cubic yards of overburden per hour, discharges load more than 420 feet away.



How Cuba Mine saves on cost of lubricating the Kolbe wheel

Only 9 products to do all lubricating jobs on earthmoving giant



Cuba Mine management knows how to hold down operating costs—including lubrication. Standard Oil lubricants are used throughout on the Kolbe wheel.

Here's how money is saved on lubrication of the Kolbe wheel:

(1) The best lubricants and greases are used. This means lubrication breakdowns don't happen. Thus, idle plant charges are eliminated. Lubricants and greases last longer. So do motors and parts. (2) Quality products do more jobs. With only nine products, savings are made in handling and inventory. There are fewer products to train men to apply and fewer chances of application mistakes. (3) One source means one responsibility for keeping the mine supplied with the petroleum products needed. And from one source mine management can get responsible lubrication technical assistance, and they can get it in a hurry. Ken McDaniel, the mine's Standard Oil man, lives less than 45 miles away.

The lubricants and greases that will save you money and the technical assistance to show you how to use them are available from Standard Oil. Call our office near you anywhere in the 15 Midwest or Rocky Mountain states. Or write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.



*You expect more from STANDARD
and you get it!*

**Lubricants and Greases used on
the Kolbe Wheel**

STANOGEAR Compound Nos. 3, 5, 6, 8

RYKON Grease No. 2, E. P.

CALUMET Viscous Lubricant

STANOLUBE HD Moly Grease

STANOIL Industrial Oil

INDOIL Industrial Oil No. 15

Standard Oil lubrication specialist Ken McDaniel (right) checks out lubrication needs with Cuba Mine superintendent Cecil Clayberg. This is work for which Ken is well equipped. He has six years' experience in such work plus an engineering degree from the University of Illinois. In addition, he has completed the Standard Oil Sales Engineering School.



People in Coal



New Coal Show Chairman

F. STILLMAN ELFRED, chairman of the board, Peabody Coal Co., Chicago, has been named to the chairmanship of the program committee for the 1961 Coal Show of the American Mining Congress, to be held in Cleveland, May 15 to 18.

Mr. Elfred will head a nation-wide committee of coal mine operators and equipment manufacturers in the task of selecting subjects and speakers for the show, which will draw thousands of mining men from all parts of the country and from abroad.

Mr. Elfred, who until recently served as chairman of the board of the National Coal Association and continues as a director, has been chairman of the board at Peabody Coal since April, 1958. He was general manager, Explosives Div., Olin Industries, Alton, Ill., and from 1952 to 1957, executive vice president, Olin Industries and Olin-Mathieson Chemical Corp., N. Y. C.

A director of Olin-Mathieson and the Great Western R. R., Mr. Elfred is a native of Denver. He received an honorary degree from the Missouri School of Mines and an honorary doctorate in 1955. Memberships include the American Institute of Mining and Metallurgy and the American Ordnance Association.



Warren D. Sharpenberg, superintendent, Arkwright No. 1 mine, Christopher Coal Co., has been appointed general superintendent, in charge of its Humpfrey No. 7 and Pursglove No. 15 mines. John E. Katlic, superintendent of Booth No. 6 mine, has been appointed superintendent, Arkwright No. 1.

Dr. Hubert E. Risser has been appointed principal mineral economist of the Illinois State Geological Survey. Dr. Risser, who has been a mineral economist at the survey since 1957, will succeed Dr. Walter H. Voskuil, who is retiring. Dr. Risser will direct the group in economic studies of the production, distribution and uses of minerals and mineral products with particular emphasis on their relation to the economy of Illinois and the upper Mississippi Valley. He received his undergraduate training in mineral engineering at the Colorado School of Mines, graduating in 1937. He later did advanced work at the University of Kansas, where he received a Master's degree in mining engineering and a Ph.D. in economics. Dr. Risser has been staff engineer of the coal mining section of the National Coal Association and was at one time employed by Alabama By-Products Corp. as a mine superintendent.

Hanna Coal Co. has recently announced several organizational changes and promotions. **Ralph Hatch**, statistician, has been promoted to administrative assistant to the vice president, with headquarters in Cadiz, Ohio. **George McCaa**, manager,

Ireland mine, has been promoted to general manager of underground mines. **Thomas Durbin**, formerly general superintendent, Georgetown Preparation plant and the Pipeline Div., has been named general manager of surface operations. And **Clyde Gibson**, formerly general superintendent of Ohio underground mines, has been promoted to general superintendent of underground mines.

David L. Francis, president, Princess Coals, Inc., and National Coal Association treasurer, has been elected mayor of Huntington, W. Va. Mr. Francis has been a member of the city council and assistant mayor. "I consider this job as the type of civic responsibility that every citizen should perform as part of his personal contribution to preserving our democratic society," Mr. Francis said.

F. V. Lynn, Scranton, Pa., has been elected vice president of Pennsylvania Coal Co., Dunmore, Pa., and Northwestern Mining & Exchange Co. Mr. Lynn has been secretary for Pennsylvania Coal for the past 15 yr, and will continue in that office.

Robert P. Tibolt has been elected president and chief executive officer for Eastern Gas & Fuel Associates, Boston, succeeding the late Eugene H. Bird, who died July 19.

Executive vice president since 1955, Mr. Tibolt has been associated with the Eastern organization and predecessor companies since 1920. He is a graduate of Harvard College and the Harvard

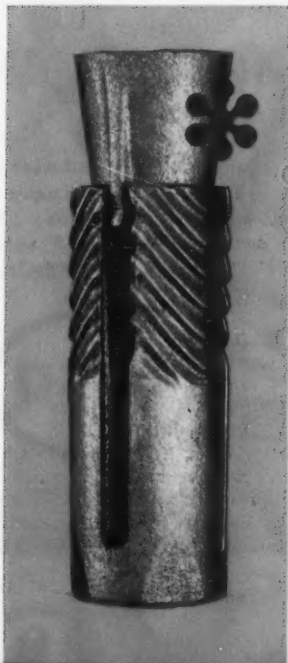
Cleon R. Fowler, formerly with Christopher Coal Co., division of Consolidation Coal Co., has been named general manager of mines for the Pocahontas Div. After graduation from West Virginia University School mines, he joined Christopher in 1940 as a production engineer. From 1948 until the present time, he served as mine foreman and mine superintendent of Christopher's Arkwright No. 1, Osage No. 3 and Pursglove No. 15 mine, and general superintendent of the Osage No. 3 and Pursglove No. 15 mines. Mr. Fowler is a member of the AIME, West Virginia Coal Mining Institute and is a past president of the Monogahela Valley Coal Mining Institute. With his wife and daughter he lives at Morgantown, W. Va., but will soon move to Bluefield, W. Va.

O-B Designs For Mining Men



RESULT:

A 4-way expansion unit that holds in soft shale or hard rock



4-WAY EXPANSION UNIT BUILDS HOLDING POWER FAST . . . because the flexible fingers of the shell are slightly pre-expanded to grip the wall even before wrenching begins.

GOES UP FAST AND STAYS PUT. When the bolt is shoved up the hole, the expansion unit holds the bolt in place until it's tightened . . . no need to have hands exposed to injury during wrenching.

GREATER STRENGTH IN HARD TOP . . . BETTER "PURCHASE" IN YIELDING TOP . . . because the expansion pressures are spread evenly over the four shell fingers to make the best use of the entire unit's strength. These are the reasons for the O-B Expansion Unit's popularity with mining men. It is easy to understand why more mine roof is supported with O-B Shells and Plugs than with any other kind.

For further information and prices, see your local O-B sales-engineer or write us now. OHIO BRASS COMPANY, MANSFIELD, OHIO. Canadian Ohio Brass Company, Ltd., Niagara Falls, Ontario.

Ohio Brass 

EXPANSION SHELLS AND PLUGS • LINE MATERIALS • SAFETY
AND CONTROL EQUIPMENT • ELECTRIC HAULAGE MATERIALS

HOLAN

1004B-M



ESSO LUBES CUT COSTLY EQUIPMENT WEAR

1. NAKTA® Lubricants stay put in mine car wheel bearings even under the wettest conditions. Proved over many years and millions of miles of mine car wheel service.

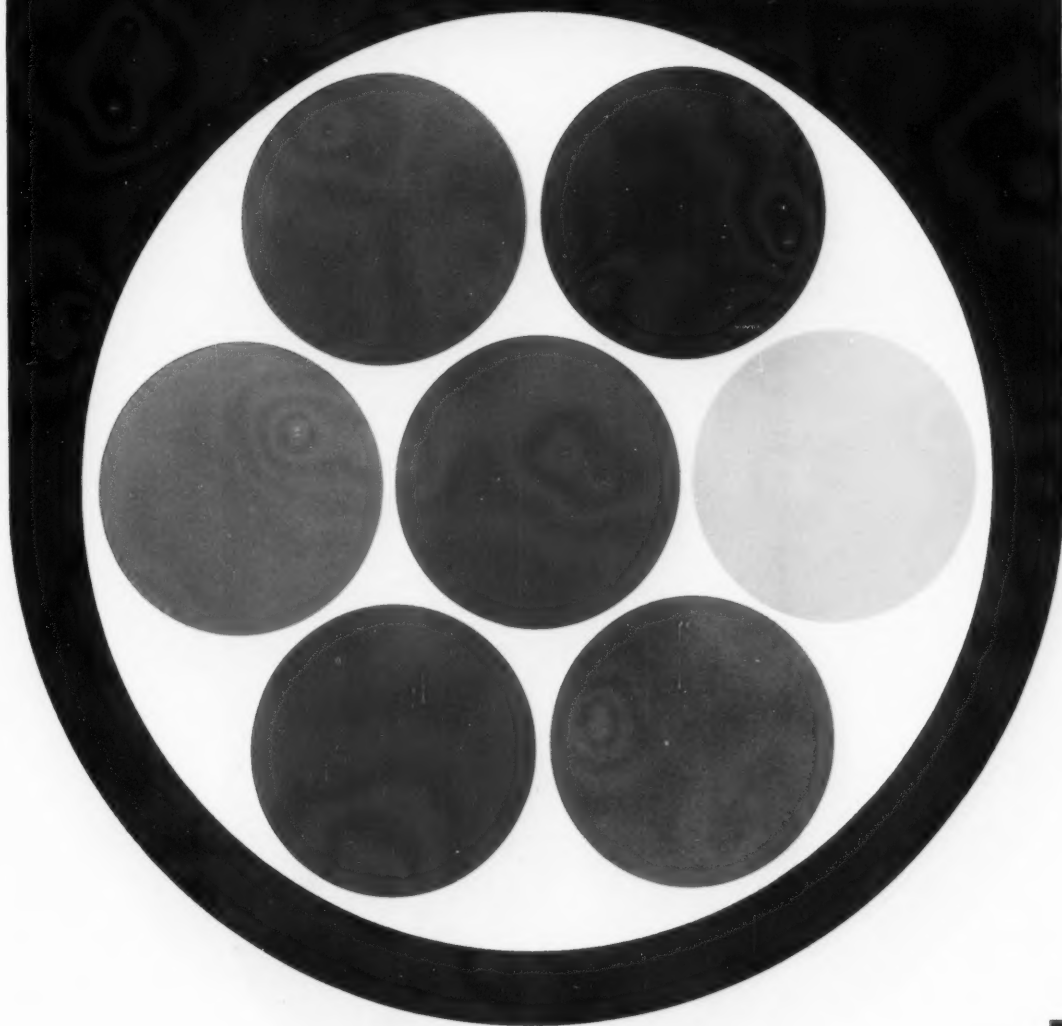
2. NEBULA® EP multi-purpose grease is highly versatile... provides extreme-pressure and anti-wear qualities. Available in grades for both bearings and gears. Exceptionally resistant to water, oxidation, or thinning by heat. Reduces number of greases needed with their attendant costs of handling, storage and equipment investment.

3. AROX® EP Lubricants lower corrosion and wear in air powered equipment... 4 ways. (1) Guard against pounding wear with extreme-pressure agents; (2) Stick tightly to metal surfaces to ward off rust; (3) Minimize acid corrosion; (4) Atomize as desired in cold weather.

For further information on these and other special lubricants, contact your local Esso office or write: Esso Standard, Division of Humble Oil & Refining Company, 15 West 51st Street, New York 19, New York.



In Industry after Industry... "ESSO RESEARCH works wonders with oil"



IN ELECTRICAL WIRE & CABLE . . . **THE SPARK OF QUALITY IS KAISER WIRE EXPERIENCE**



PORTABLE CABLE... MORE DRAG MILES IN TOUGH COAL MINE DUTY

KAISER PORTABLE CABLES—now available in more than 300 types/designs/sizes—offer superior resistance to tearing, impact, or breakage in every price range.

For example, Kaiser Kalzone Insulation—a Butyl insulation for service over 2000 volts—surpasses ASTM D-1352 requirements for strength by 41 per cent...elongation by 83 per cent. Kaiser 60 Per Cent Neoprene Jacketing Spec. 14-S surpasses ASTM D-752 strength by 72 per cent...elongation by 100 per cent. Completed cables receive additional superiority from K/W design and construction methods.

Kaiser Portable Cables are approved for listing by Pennsylvania Department of Mines and Federal Bureau of Mines.

The result: In rough duty—shuttle buggies, cutters, loaders, shovels—K/W cable can mean as much as five times as many drag miles per cable...fewer splices or delays...more production from each piece of equipment.

FOR IMMEDIATE INFORMATION ABOUT KAISER PORTABLE CABLES MADE ESPECIALLY FOR UNDERGROUND AND STRIP MINING, CALL YOUR K/W DISTRIBUTOR OR WRITE KAISER ALUMINUM & CHEMICAL SALES, INC., KAISER CENTER, 300 LAKESIDE DRIVE, OAKLAND 12, CALIFORNIA.



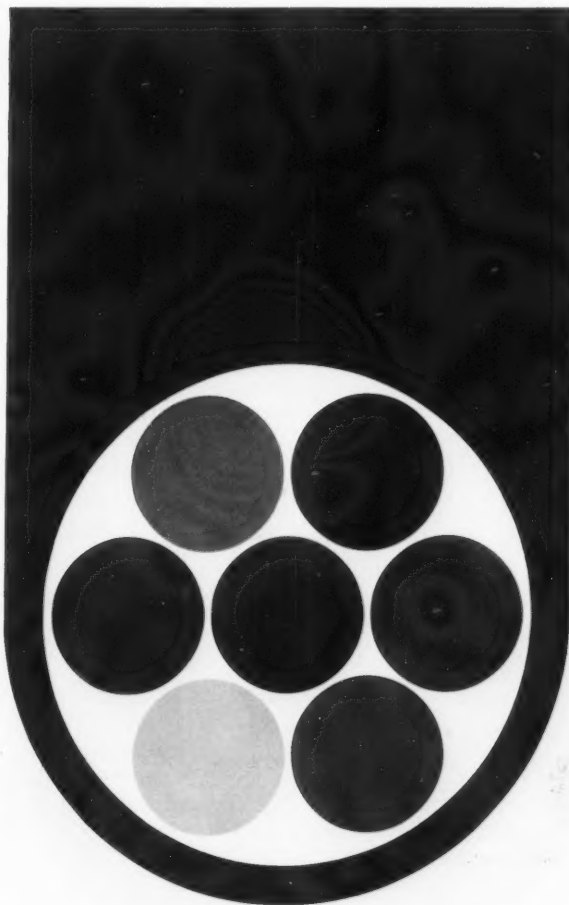
IN ELECTRICAL WIRE & CABLE THE SPARK OF QUALITY IS **K/W** EXPERIENCE

The spark of quality means positive—often dramatic—savings in service for mines who will specify Kaiser Portable Cable.

For among the world's leading electrical wire and cable producers, only Kaiser is heir to the 70-year experience of a major rubber company in developing insulation and jacketing compounds.

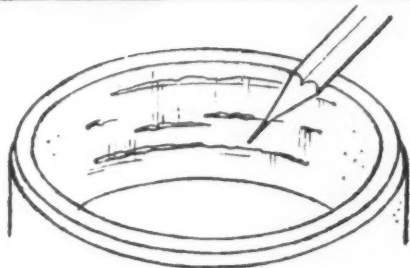
Over the years this special background and experience has created a wide choice of Kaiser Portable Cables that consistently deliver extra performance life for every dollar of cost.

Why not use K/W
experience
to your
advantage?

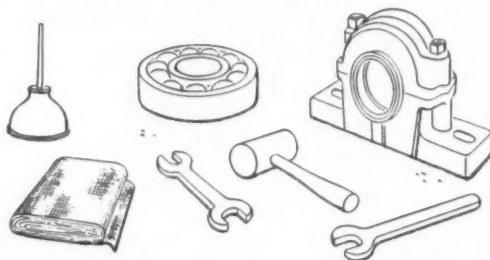




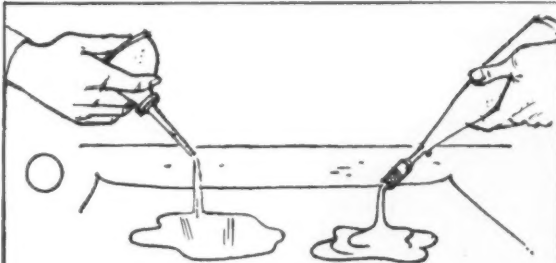
DISTRIBUTOR DAN the **SKF** bearing man, tells **WHAT DIRT DOES TO BEARINGS** —and how you can help keep it out



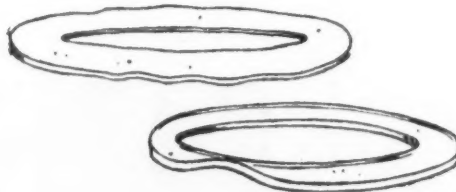
LOOK FOR POLISHED, CLEARLY-MARKED BALL OR ROLLER PATHS. They're sure signs that dirt is getting into your bearings, causing lapping of the parts and ultimate failures. To eliminate this problem, follow the steps shown here.



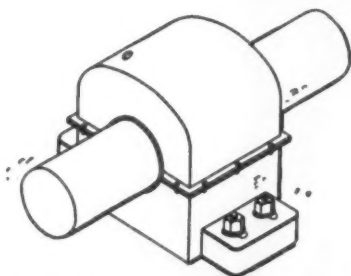
START WITH GOOD "HOUSEKEEPING." Work with clean tools in a clean area. Before you replace a bearing, clean the housing—both inside and out. Always handle a used bearing as carefully as you would handle a new one.



LOOK OVER YOUR LUBRICANTS AND LUBRICATING EQUIPMENT. Dirty oil and grease carry foreign matter with them, right into the bearing. So check them for cleanliness before you use them—and your grease guns and oil cans, too.



IS THE SEAL BENT OR WORN? If it is, dirt and dust and other foreign matter can get into the bearing. If moisture or water is present, you'll need seals made of special moisture-resistant materials.



WHERE DIRT IS A CONTINUAL PROBLEM, try shrouding the bearing housing in a metal box like the one shown here. It's inexpensive, easy to build and helps deflect dust and dirt away from the bearing.

Whenever you're baffled by a bearing problem, consult your Authorized **SKF** Distributor. His staff of experienced bearing specialists are always ready to serve you—and he stocks all types and sizes of the bearings you need, ready for immediate delivery.

SKF
AUTHORIZED DISTRIBUTOR



6006



Spherical, Cylindrical, Ball, Tapered and REED Miniature Bearings

EVERY TYPE—EVERY USE

SKF

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

*REG. U. S. PAT. OFF.

People in Coal (Continued)

Graduate School of Business Administration.

He served in executive capacities with Massachusetts Gas Co. and New England Fuel & Transportation Co., predecessors of Eastern, and New England Coke Co. and Mystic Iron Works, subsidiary companies. He was elected a vice president of Eastern in 1947 and became a trustee of the firm in 1956.

Mr. Tibolt's responsibilities include being officer and director of subsidiaries of Eastern, including Boston Gas Co. He is also a director of the Norfolk & Western Ry., The First National Bank of Boston and the National Coal Association.

Active in professional, trade, and other business organizations, he was president of the Greater Boston Chamber of Commerce from 1959 to 1960 and is presently chairman of the chamber board of directors.

In addition to its naming of Robert Tibolt as president (top), Eastern Gas & Fuel Associates announced four other high-level promotions: James W. Ty-

son II, vice president, was named senior vice president and a trustee and member of the executive committee; William B. Ross, vice president, was elected vice president and general manager, Coal Div.; Allan C. Johnson, vice president, was named vice president and executive assistant to the general manager, Coal Div.; and John R. Philips, assistant to the executive vice president, was named vice president. Mr. Tyson has been a vice president of Eastern since 1945. He is a graduate of New York University and was associated at one time with Koppers Co. He is an officer and director of several subsidiaries of EG&F and a director of the First National Bank of Bluefield, W. Va. Mr. Ross has been associated with Eastern since 1940 and prior to that time had been with the Koppers Co. in its coke operation. Mr. Johnson joined Eastern in 1946 after serving in industrial relations capacities with the Best Foods Corp. Mr. Philips joined Eastern in 1946 and has been assistant to the vice president and executive vice president, and special assistant to the president since 1952.

Obituaries



James H. Fletcher, consulting engineer, chairman of the board and president of J. H. Fletcher & Co., and originator of rubber-tired haulage underground, died July 18 at his home in Wilmette, Ill. He was 71. Born at Wayne, Ill., Sept. 11, 1888, he received an electrical engineering degree from Armour Institute of Technology in 1911. After a couple of short jobs he joined the Allen & Garcia Co., then 2 yr old. Growing with the organization, he headed the Underground Mining and Report departments, and was treasurer of the company until he established his own consulting practice in 1936. Among his contributions in the 1911-36 period was the first mine air-conditioning venture to control roof falls—at the Saxton mine, Terre Haute, Ind.

Later he was responsible for the design and development of the Wildwood mine, Butler, Pa., first to use a slope belt to reach coal over 250 ft below the surface and the first to use a straightline pillar system. He also visited Russia to liquidate the Allen & Garcia engineering contract.

Immediately after establishing his own office in 1936 Mr. Fletcher opened the No. 5 mine for the Blue Bird Coal Co., Carrier Mills, Ill., with rubber-tired tractor-trailer haulage behind the loading machines. The system soon was adopted by the Moffat Coal Co., Sparta, Ill., and the Hart Coal Co., Madisonville, Ky. After the introduction of the shuttle car in 1938, Mr. Fletcher and A. L. Lee, now with Consol, developed the first two-wheel-drive, four-wheel-steer cars. The Lee-Norse Co. was formed to manufacture them.

Organization of J. H. Fletcher & Co., now operated by Mr. Fletcher's two sons, J. Robert and William F. Fletcher, was a by-product of his interest in off-track equipment. It was formed in 1937 to make possible the furnishing of such equipment and since has become noted for timbering machines, roof drill and track tampers, among other products.

In the period following World War II Mr. Fletcher assisted in the planning and development of the Orient No. 3 mine, first to be designed for complete production by continuous miner, and was responsible for the design and development of the Enoco mine of Enoco Collieries, Inc., Bruceville, Ind., another of the early all-continuous-miner properties.



resistant...

**FIRE-,
IMPACT-,
RIP-RESISTANT**

RUSLON
PVC conveyor belts

These amazing new conveyor belts can't burn (USBM28-25) and have no obnoxious nor combustible fume hazard. Because of interlocking homogenous construction, there is no ply separation—and each belt is particularly resistant to longitudinal and edge tearing. Write for bulletin.

*The Trademark of Ruslon Fenoplast Conveyor Belts



See it at Booth No. F9-10
BLUEFIELD COAL SHOW
Bluefield, W. Virginia
Sept. 21-22-23

MANUFACTURED IN THE U.S. by
THE RUSSELL MFG. COMPANY
MIDDLETOWN, CONNECTICUT

Distributed by:
West Virginia Belt Sales, Inc.
Mount Hope, West Virginia

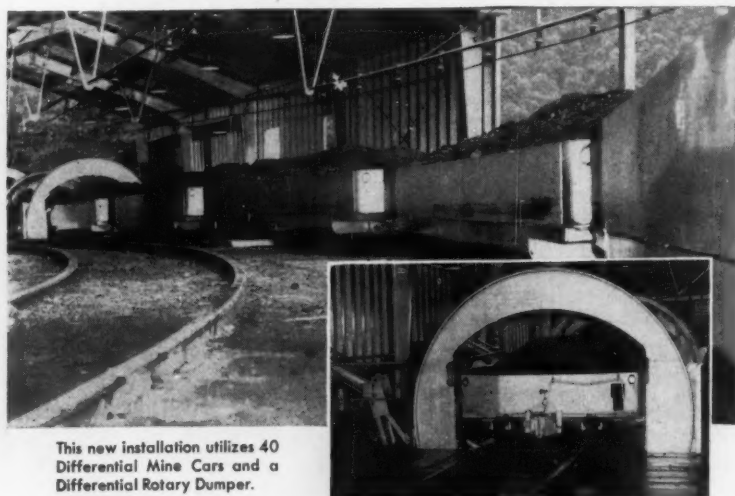
Current Coal Patents

By Oliver S. North

Coal rock sensing system, S. I. Persson and W. A. Leet (assigned to General Dynamics Corp., Rochester, N. Y.), July 12, 1960. In an apparatus for detecting the entry of a coal cutting bit into rock during the operation of a bore-mining machine, two or more inertial accelerometers are mounted on the machine to sense the increased vibration thereof

when the cutting bit enters rock. The signal to the operator indicates the direction of vibration caused by the rock impact, thus enabling him to steer the machine away from the rock. No. 2,944,804.

Four wheel steering mechanism for a mine car, C. V. Osborne, July 12, 1960. Improved steering mechanism for an electrically driven mine car equipped



This new installation utilizes 40 Differential Mine Cars and a Differential Rotary Dumper.

haulage capacity...

Place: Near Whitesville, W. Va.

Operator: Name on request

Car Dimensions: Length 21' 6"
Width 7' 6"
Height 31" (above rails)
Weight 8000 lbs. (empty)

Capacity: 310 cu. ft. (level load)
390 cu. ft. (crown load)

where can you match it?

Since 1915 —
Pioneers in
haulage equipment



with pneumatic tires and a four-wheel drive. The mechanism is completely incorporated into the car frame structure, and additionally functions as a working part of the frame. No. 2,944,830.

Mining machine having means for cutting side wall holes for roof timbers, S. C. Moon (assigned to Jeffrey Mfg. Co., a corp. of Ohio), July 19, 1960. A mining machine is provided with laterally directed cutting means adapted to be fed into the side walls of the mine for making openings therein in which to place roof timbers which span the roof of the mine. Side holes are made simultaneously with advance of the cutting head in a forward direction in the seam. No. 2,945,686.

Process and apparatus for the separation of solid particulate materials of different densities and/or different particle sizes, P. Belugou and E. Condolios (assigned to Charbonnages de France, Paris, France, and Etablissements Neypric, Grenoble, France), July 26, 1960. These two patents describe and illustrate in detail a process and apparatus for concentrating and sizing crude coal, based on relative densities of the pieces and differences in particle sizes. The sorting is carried out in a closed conduit through which a liquid or gas is passed under a suitable hydraulic or pneumatic head. Nos. 2,946,438-9.

High density thickener, C. L. Peterson and B. L. Derringe (assigned to Peterson Filters & Engineering Co., Salt Lake City, Utah), July 26, 1960. Method of and apparatus for filtering and thickening high solids coal process slurries and the like. The rotary filter leaves are arranged to form a series of discs along a shaft, and a deep settling zone is provided for the slabs of filter cake, so that the cake may be blended into a dense thickened magma. No. 2,946,448.

Excavator apparatus having stepper type advancing means, A. De Smaele, July 26, 1960. Design for a coal mining machine adapted to move into the seam without being accompanied by an operator. The machine is provided with a deformable casing which can be injected with a fluid under pressure to cause it to expand into tight engagement with the walls of the mine working. No. 2,946,578.

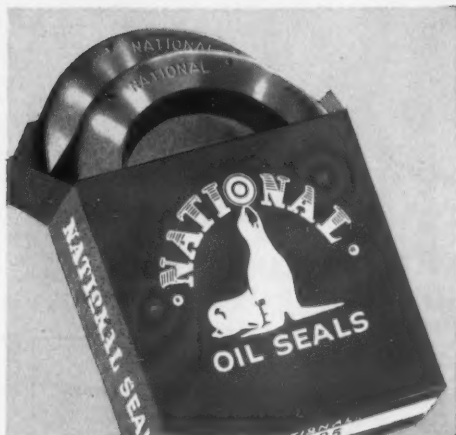
Ventilation control system, J. V. Burgess, Aug. 2, 1960. In a mine ventilation control system, a flexible, fire-resistant and gas-imperious material is used as line brattices, check curtains and temporary stoppings to effect circulation of air in predetermined paths and prevent undesirable gases from reaching working areas. No. 2,947,239.

(Continued on p 42)

Better products, *faster*, from your National Seal specialist:



How National Oil Seals can help hike coal production while whittling operating costs



Seals . . . a good place to start paring down costly maintenance and curbing downtime

Let National Oil Seals put grit, water and corrosion . . . the bane of bearing life . . . under positive control in your mining equipment. Protect your investment against these constant enemies. Keep your equipment working and earning. Minimize downtime with these better seals which hold lubricants in place. Truly, this small investment pays off in more consistent production and longer equipment life.

National Oil Seals in Micro-Tort leather or Syntech rubber are easy to install and come in sizes and types to fit most every requirement. Your National Seal specialist gives you off-the-shelf delivery on the full line. He is always nearby.

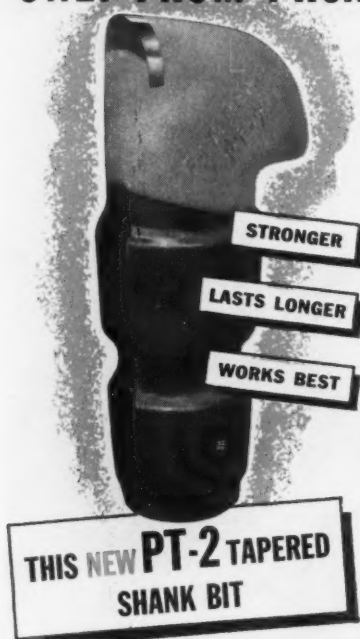
NATIONAL OIL SEALS

FEDERAL-MOGUL SERVICE

DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC., DETROIT 13, MICHIGAN



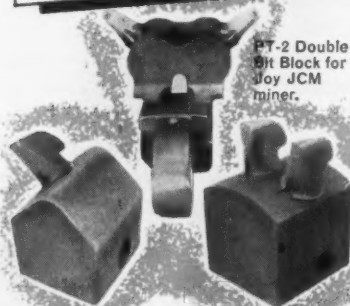
ONLY FROM PROX



Ends down-time due to failure of set screws, roll pins, rubber retainers, or broken shanks. Results in less inventory, less maintenance.

Round shank exceeds 3 times the back-up area of conventional bits. Incorporates improved aligning—assures perfect match between holder and bit—is easily removed from top or bottom. You get less distortion; positive bit-angle maintained; quicker, more accurate setting; no bit vibration; longer life for carbide.

**Bit-Lug designed for
QUICK-CHANGE PT-2
—saves \$\$\$\$\$**



PT-2 Single Lug for Joy Pineapple on JCM machines.

PT-2 Double Lug for Joy Pineapple on JCM machines.

Investigate the complete line of Prox cutting equipment.

PROX
FRANK PROX COMPANY, INC.
TERRE HAUTE, INDIANA

Write for the name of your nearest Prox Sales Representative for complete information.

Patents (Continued)

Mine roof bolt and bolting system, E. J. Hohos and J. A. Richard (assigned to Mine Safety Appliances Co., a corp. of Pa.), Aug. 2, 1960. In an improved mine roof bolting system, the usual holes are drilled, and standard roof bolts are inserted in most of them. At intervals, however, an indicating bolt is used; the indicating bolt is weaker than the regular bolts and will break sooner than the others when the roof begins to sag, thereby showing that the roof is becoming dangerous. No. 2,947,279.

Auger boring machine for mining coal, N. W. Densmore (assigned to Joy Mfg. Co., Pittsburgh, Pa.), Aug. 9, 1960. Improved supporting and guiding means for an auger drill string of a boring head type mining machine whereby friction at the exterior edges of the spiral vanes or flights of the auger sections is reduced to a minimum, thereby reducing the power consumed in the rotation of the auger string. No. 2,948,520.

Equipment Approvals

The Jeffrey Mfg. Co.—Type MI-81A crawler-loading machine; five motors, four 20 hp and one 4 hp, 440 V, AC. Approval No. 2F-1568A, July 7.

Old Ben Coal Corp.—Type IIBU-8PE rebuilt Joy loading machine; two motors, one 75 hp and one 4 hp, 440 V, AC. Approval No. 2F-1569A, July 11.

Femco, Inc.—Model SF2520 20-shot blasting unit equipped with three Eveready No. 457, 67.5-V dry batteries or equivalent. Approval No. 16E-11, July 13.

The Jeffrey Mfg. Co.—Type MM-70RA cutting machine; two motors, one 50 hp and one 25 hp, 250 V, DC. Approval No. 2F-1570, July 19.

Joy Mfg. Co.—Type 18C3PH/PXH-1 shuttle car; four motors, two 20 hp, one 7½ hp and one 15 or 7½ hp, 440 V, AC. Approval No. 2F-1571A, July 20.

The Jeffrey Mfg. Co.—Type MT-68 shuttle car; three motors, each 10 hp, 250 V, DC. Approval No. 2F-1572, July 20.

Give

The UNITED Way

**The Company
that cares enough
to give you
the best!**

Massco-Grigsby

PINCH VALVES



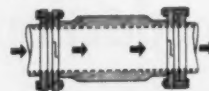
**RUBBER, NEOPRENE
for Corrosion and Abrasion**

- 1" to 14" inside diameter.
- Pressures to 150 psi.
- Temperatures to 200° F.

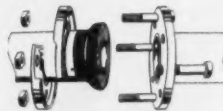
- Patented "hinged" sleeve. Recesses serve as "hinges" during compression; reduce strain and permit tight closing.



- Cannot leak or stick.
- No working parts in contact with pulp or liquid; no packing glands.



- Unobstructed flow eliminates high friction loss.
- Remote control available.
- Can be equipped for automatic regulation.



- Split flanges and patented Flex Seal ends assure perfect seal.

See Booth 302,
American Mining Congress
Las Vegas meeting,
October,
for latest
advancement in valve
automation.

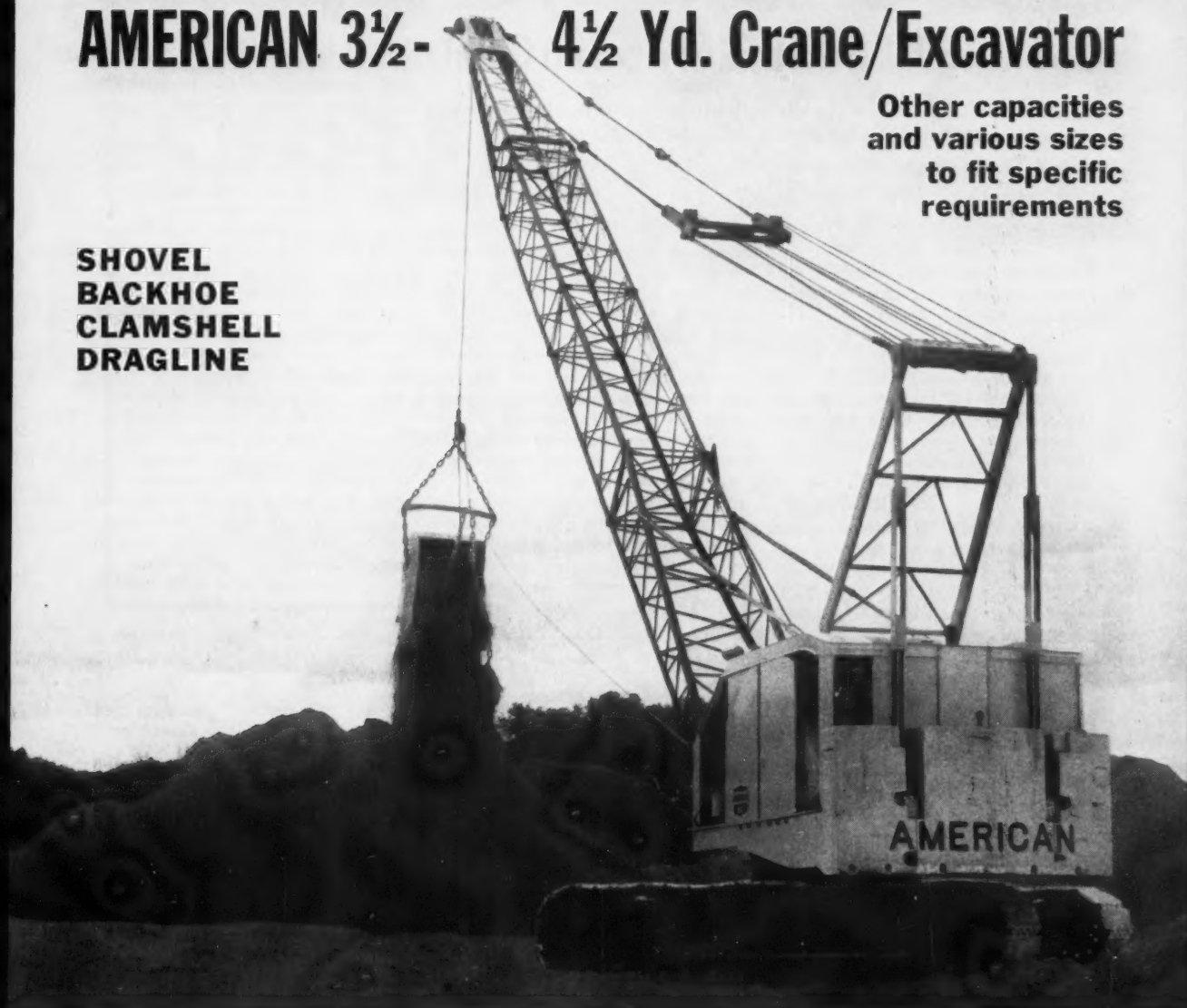
MINE AND SMELTER SUPPLY CO.

3800 RACE STREET • DENVER, COLORADO
OFFICES AND AGENTS IN PRINCIPAL CITIES

New! Exclusive In Its Class! FOR TOUGHER, FASTER MINING OPERATIONS AMERICAN 3½- 4½ Yd. Crane/Excavator

Other capacities
and various sizes
to fit specific
requirements

SHOVEL
BACKHOE
CLAMSHELL
DRAGLINE



New AMERICAN "900" SERIES Dragline with 100-foot Boom and 4-yard Bucket.

**ENGINEERED FROM GROUND TO BOOM TIP TO WITHSTAND
SEVEREST SHOCK AND STRAIN . . . Full 18" Ground Clearance! . . .**

3 Crane Booms . . . up to 270 Ft. in length! . . .

Most rugged Machinery Deck in its class!

Get all the high volume—low maintenance facts on the industry's newest
Crane/Excavator now!! See your American Distributor or
contact us direct with the coupon.

American builds 'em better . . . so you can finish faster.

AMERICAN HOIST

and Derrick Company

St. Paul 7, Minnesota

PLEASE SEND ME ALL THE FACTS AND FIGURES
ON AMERICAN'S BIG "900"

Name _____
Company _____
Address _____
City _____
Zone _____ State _____

MAIL TO:
AMERICAN HOIST AND
DERRICK CO.
ST. PAUL 7,
MINNESOTA

Coal Abroad

Looking Ahead at European Coal

Economic committee reports its findings and makes predictions about the future of the European Coal and Steel Community

Helen Avati, McGraw-Hill World News, Paris

THE EUROPEAN COAL INDUSTRY must become more efficient and competitive if it is to keep its position in the energy market from worsening in coming years.

This is the conclusion of the Coal Committee of the Organization for European Economic Cooperation (OEEC) in a report entitled "The Coal Industry in Europe," published at the end of June.

In the 2 yr covered by the report—1958 and 1959—apparent coal consumption of OEEC member countries fell by some 62 million tons, the committee points out, or nearly 6% per year. During the period from December, 1957, to December, 1959, pithead stocks rose from 16 million to 68 million tons, while

consumer stocks fell from 42 million to 33 million. This excess of supply over demand is a complete reversal of the coal shortage that existed almost continually from the war through 1957, which made experts predict that western Europe's coal requirements would grow steadily for the next two decades.

In view of this change, the coal committee has taken another look at the industry's prospects for 1960 and through 1965. This year, the report estimates, demand is likely to remain at the 1959 level of around 448 million tons, probably accompanied by a further increase in stocks at the pithead. For the 5-yr period through 1965, too, the committee thinks consumption can remain at

the 1959 level. Its reasons, set forth in the report, are that industrial activity in the OEEC area will increase steadily, bringing a growing demand for all forms of energy. Although much of the increase is expected to be taken up by other fuels, especially oil, forcing down coal's percentage of the total energy market, the absolute demand for coal should continue at present levels.

Analyzing the trend of coal consumption over the next few years by sector in an annex to the report, the coal committee sees big consumers such as the iron and steel industries and thermal power stations increasing their consumption. For railways and gas plants, the committee expects the gradual but definite trend away from coal to continue. In other industries, and in the home-heating sector where competition between coal and oil products is sharp, demand will depend mainly on prices.

According to the report, the coal recession is due to structural factors, helped out by the 1958 recession and by unusually good winter weather. The drop of 38 million tons in OEEC coal consumption in 1958, the report states can be chalked up to: the recession in industrial activity (11 million tons), the switch from coal to oil (12 million),

Galis Facemaster DRILL

Fast, fast positioning - Most profits!

The new Galis Facemaster Drill has all and more of the money making features of the Roof-Master which took the coal industry by storm. Literally more than a hundred were sold before we realized it. And now comes the latest perfected 24" permissible face drill by Galis.

- Auger stays level during lift.
- Auger stays perpendicular to face during swing.
- Auger can be rotated 90° cw and 90° ccw. from longitudinal position.
- All hydraulic.
- Greatest flexibility in drilling for cross cuts.
- Minimum of repositioning auger for next hole.
- Drill guides readily changed for accommodating auger diameters.
- 20 HP Motor.
- One man operation.
- One hand control for tramping and steering.
- Majority of parts interchangeable with Galis Roofmaster Drills.

Remember Galis for repairing and rebuilding all underground equipment.

Galis

ELECTRIC & MACHINE CO.
MORGANTOWN, W. VA.

Phone London 2-7346

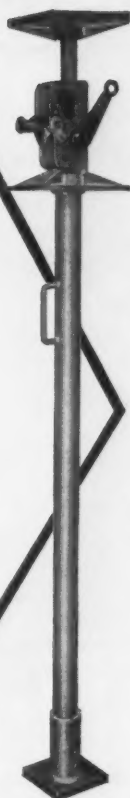


**NEW easy way to
recover roof bolts with**

SIMPLEX

**TRIP POST
JACK No. M279**

- 24" Rack Bar Travel
- High Strength Aluminum Alloy Column and Castings
- Light weight — 72" min. height, weighs only 36 lbs.
- Sizes for all seam heights available



SAFE, EASY-TO-USE...

**Two men can recover
350 bolts per day by
using it as follows . . .**

Place a Jack alongside each of the first row of bolts closest to the face. Raise to the roof to provide temporary support. Remove bolts by hand or pneumatic wrench. Stand 25' or more away and pull on a rope attached to the Jack trip lever which collapses the Jack. Move Jack to position under the next row of bolts and proceed as previously.

SEE YOUR DISTRIBUTOR, or write
TEMPLETON, KENLY & CO.
2501 Gardner Road, Broadview, Illinois

WORLD'S LARGEST MFGRS. OF INDUSTRIAL
MECHANICAL AND HYDRAULIC JACKS



WHAT YOU DON'T KNOW HURTS!

Most key mining officials
read COAL AGE because it
helps them do a better job.

*If you're not a regular subscriber,
Mail this coupon TODAY*

COAL AGE, Fulfillment Manager,
330 West 42nd St., New York 36, N. Y.

Send me COAL AGE for 1 year at \$3 (U.S. and Canada only.)

☐ Check enclosed ☐ Bill Company ☐ Bill me

Name Position

Mailing Address: ☐ Home ☐ Business

City Zone State

Mining Company

Hdqs. or Mine Name CA960

To Save Delay, Please Fill Out Completely

**DOUBLES
AND TRIPLES
CONVEYOR BELT LIFE**

**LINE
WITH
LINATEX**

**LINATEX HAS UNEQUALED
ABRASION RESISTANCE FOR:**

Transfer Chutes Feeders
Skirt Boarding Belt Wipers
Pulley Lagging Return Idlers

COLD BONDING PROCESS — JOB SITE APPLICATION

LINATEX CORP. OF AMERICA
P.O. DRAWER "D", STAFFORD SPRINGS, CONN.

Bucket built 2½ tons



15% increase in capacity—14% weight reduction in this USS "T-1" Steel 15-yard dragline bucket for India.



This mark tells you a product is made of modern, dependable Steels.

lighter with "T-1" Steel

A new 15-cubic-yard Page AUTOMATIC Dragline Bucket for service in India makes maximum use of USS "T-1" Constructional Alloy Steel that cuts dead weight, increases capacity and boosts service life as much as five times. Designers increased capacity of this bucket 15%. Ten tons of USS "T-1" Steel were used in the bucket in plate thicknesses of 2 1/4", 3/4", 5/8" and 1/2".

"T-1" Steel bucket yields 20 months' continuous service for DeLauter Coal Company. Mr. Roy DeLauter, Superintendent of DeLauter Coal reports, "Our Page AUTOMATIC Dragline Bucket, made of "T-1" Steel, has worked 24 hours a day, continuously for 20 months, stripping earth and lime rock from our seam which is buried some 80 feet in the ground. We've never had, heard of, or seen another bucket like it. It has given us five times as much trouble-free service as any other kind of material on the market. Why, during these 20 months, this bucket was never off the rig! And it's practically unheard of to run a stripping machine without a spare bucket. Yet we neither had a spare nor ever needed one."

In addition to this performance by USS "T-1" Steel at the 100,000 psi yield strength level for shovel booms, dozer blades, trailer bodies and mine cars, United States Steel also offers three other grades of steel at the 50,000 psi yield point level.

Depending on the economics and design involved, USS MAN-TEN, COR-TEN, and TRI-TEN brands of High Strength Steel also offer lighter weight construction with lower costs. USS MAN-TEN Steel features increased strength with high abrasion resistance for bolted or riveted construction. USS COR-TEN Steel is noted for higher strength with superior resistance to atmospheric corrosion. USS TRI-TEN offers strength and toughness with excellent weldability.

For long-life screens, USS Stainless Steel can't be beat. For more information on these special steels, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

USS, "T-1", COR-TEN, MAN-TEN and TRI-TEN are registered trademarks

Five times more life from this 7-yard USS "T-1" Steel bucket used by DeLauter Coal Company in Ohio.



United States Steel Corporation—Pittsburgh
Columbia-Geneva Steel—San Francisco
National Tube—Pittsburgh
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Supply—Steel Service Centers
United States Steel Export Company
United States Steel

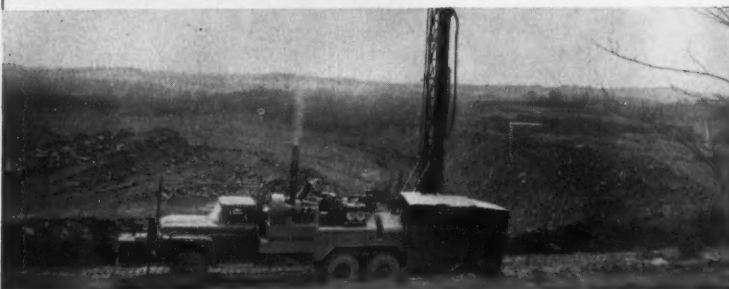




Harmon Creek Coal speeds stripping with

DAVEY

Rotary Drills



Like other leading mine operators, Harmon Creek Coal Corporation, Burgettstown, Pa., speeds drilling and cuts costs with Davey Rotary Drills.

Daveys can be mounted on any make of truck . . . move fast between blast holes . . . are easy to set in position . . . ideal for low cost drilling. Offered in 8 truck-mounted models with capacities to 3,500 ft. Tractor-mounted drills also available.

A-226A

Write for Bulletin E-702S!

DAVEY

DAVEY COMPRESSOR CO.

Kent, Ohio

pioneers of
"air-cooled air"



Coal Abroad (Continued)

higher fuel efficiency (6 million), the mild winter (5 million), and exceptionally good hydroelectric conditions (4 million). Finally, demand for European coal was also affected by imports from other countries outside the OEEC area.

In spite of difficulties in selling its output, the European coal industry kept production in 1958 close to 1957 levels, the report states. For the area as a whole, production fell by only 2% in 1958, but a rise in stocks forced producers to make a further 4.6% cut in 1959.

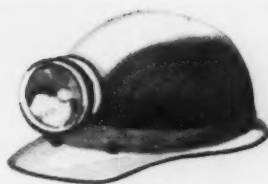
In order to bring production into line with demand, coal producers in some member countries shortened shifts, stopped recruitments and instituted a policy of not replacing miners who left, according to the report. This resulted in a reduction of 140,000 underground miners out of a registered total of 1,200,000 between January, 1958, and the end of December, 1959. Other steps taken by OEEC countries were restrictions on imports of U.S. coal, which dropped from 44 million tons in 1957 to 17 million in 1959, lowering of coal prices, raising of fuel-oil taxes, closing down of marginal mines and freezing of pithead stocks.

If coal is produced at competitive prices in a market of fair competition, the report points out, it will continue to command large markets in coming years. "The watchword must therefore be efficient production," it states, "rather than production at any price, and concentration on the more profitable mines." This will lead to reorganization of the European coal industry, and closing down of marginal mines and seams that have proved too hard to work.

The danger, the report warns, is that production and capacity may be reduced more than necessary, which could lead to a recurrence of the coal shortage. Therefore, the coal committee recommends that these measures be reviewed periodically in light of the latest trends. "They must be based not on the assumption that the situation will get worse," the report concludes, "but on the determination to prevent that from happening by putting the industry on to a competitive footing as fast as this can be done without undue hardship to those in the industry."

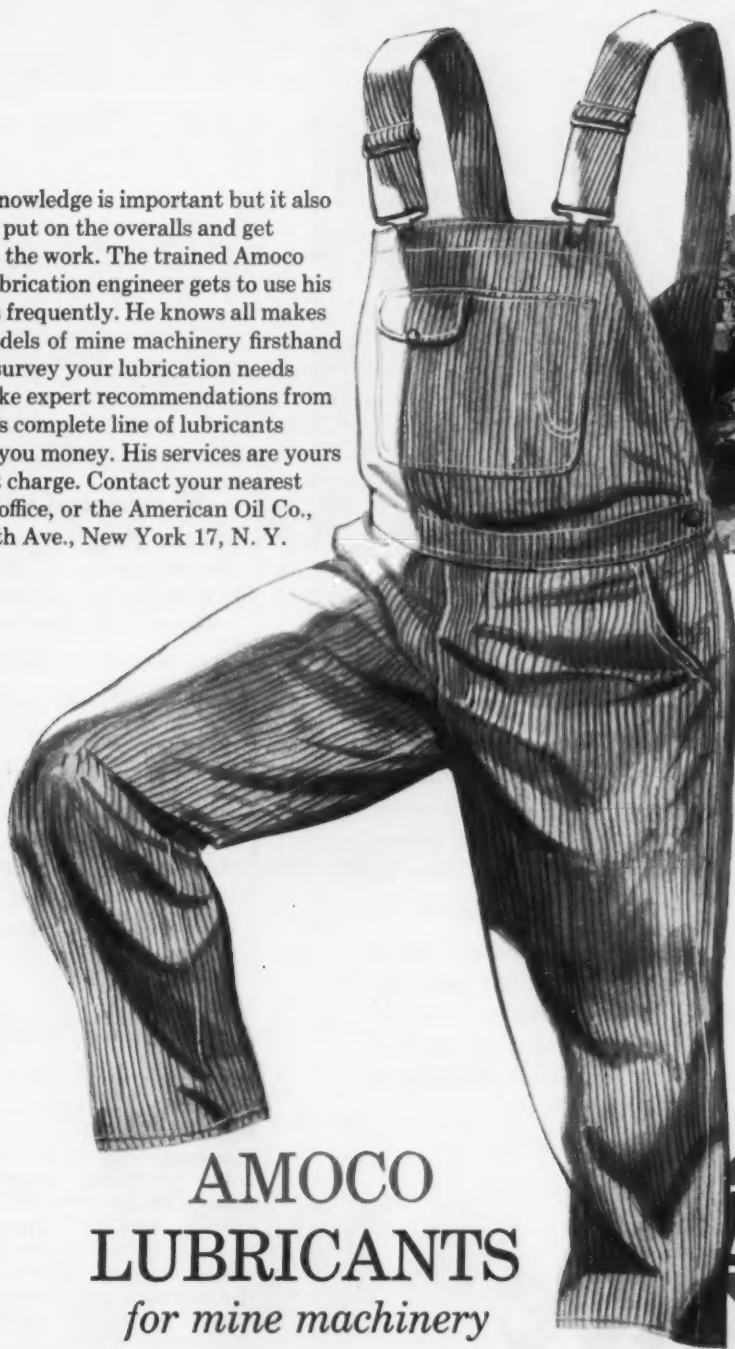
Overseas Flashes

POLAND—According to recent official Polish estimates, coal output in that nation during the current year will be about 103 million tons, 4 million more than was planned. In the next year several new coal-faces will be turned over for exploitation. Funds for the con-



His overalls...save overhauls

Book knowledge is important but it also pays to put on the overalls and get close to the work. The trained Amoco mine lubrication engineer gets to use his overalls frequently. He knows all makes and models of mine machinery firsthand...can survey your lubrication needs and make expert recommendations from Amoco's complete line of lubricants to save you money. His services are yours without charge. Contact your nearest Amoco office, or the American Oil Co., 555 Fifth Ave., New York 17, N. Y.



AMOCO
LUBRICANTS
for mine machinery





The owner of this equipment found out that true battery economy is measured by how much work is done for how long a time . . . not by low price alone. Now he buys Exide-Ironclad Batteries for his locomotives. They last longer and more work can be done, yet the cost per ton is lower. The Exide-Ironclad tubular positive plate is the reason. It exposes more active material for sure, constant power. And the armored porous tubing holds the power-producing material in the plates in spite of the shaking and jolting they are subjected to.

Before you buy another battery, find out how much Exide-Ironclad can save you. Other users find them the cheapest power they can buy—and one thing for sure, you will buy them less often and spend much less in the end. For all the details, write to Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 20, Pa.

Exide®

Coal Abroad (Continued)

tinued mechanization and electrification of coal mines have also been increased compared to last year, it is reported. Poland is the second biggest exporter of coal, next to the United States.

GREAT BRITAIN—The government in this nation announced a 50% cutback in its nuclear power program. The policy switch will involve the introduction of super-critical coal-fired stations and is expected to knock about 260 million off the capital costs for the same installed capacity envisaged in the original 1966 nuclear power program.

CANADA—Faced with the loss last year of sales of 1 million tons of bituminous coal, mostly to industries in northern Ontario which switched to natural gas, coal dock operators and coal-hauling railways are planning price action to hold their markets. Representatives of ten United States railways, along with the Canadian National R.R., Canadian Pacific R.R., and the Canadian Commercial Coal Dock Operators' Association, have agreed that lower railway freight costs are needed to meet competition.

Bituminous Output

YEAR TO DATE	PRODUCTION
Aug. 13, 1960	254,657,000
Aug. 15, 1959	251,025,000
1960 output 1.4% ahead of 1959.	

WEEK ENDING	PRODUCTION
Aug. 13, 1960	8,035,000
Aug. 15, 1959	7,197,000

Anthracite Output

YEAR TO DATE	PRODUCTION
Aug. 13, 1960	10,636,000
Aug. 15, 1959	12,351,000
1960 output 13.9% behind 1959.	

WEEK ENDING	PRODUCTION
Aug. 13, 1960	330,000
Aug. 15, 1959	360,000

Correcting the Record

Maschinenfabrik Korfmann, G.m.b.H., Witten-Ruhr, Germany, notes that the photographs supplied for use with the article "Mechanized Longwall in Morocco," *Coal Age*, June, 1960, pp 88-90, were of its "BSL" low-type cutter-loader, rather than the Russian machine actually employed. Korfmann also notes that its machine was developed in 1951 and that pictures of it appeared in Russian literature in 1956.



JOY ● A.C. Safety Circuit Centers

FOR POWER DISTRIBUTION AT UTILIZATION VOLTAGES IN A.C. MINES

SAFETY

Instantaneous power cut-off when trouble occurs:

- Eliminates shock hazard
- Prevents dangerous cable fires
- Minimizes dangerous arcing

CIRCUIT

Fast-acting circuit breakers coupled with these Joy "firsts":

- Intrinsically Safe Control (ISC)
- Ground Fault Detector (GFD)
- Molded rubber, factory-polarized cable connectors

CENTER

Rugged skid-mounted units engineered to job requirements:

- Keep trailing cable lengths short
- Facilitate moving, reduce down-time
- Individual circuit protection and fault isolation

CD 460-2

You can buy experience — at no added cost! When you specify Joy, you get the added bonus of Joy's *total mining experience* engineered into the equipment. Developed in 1946, Joy A.C. Safety Circuit Centers are serving reliably all over the mining world.

Available in both Permissible and Dust Resistant types for all standard operating voltages and frequencies.

Other Products of the Electrical Products Division



Safety
Circuit Centers



Distribution
Boxes



Portable
Lighting



Cable
Vulcanizers

WRITE for FREE Bulletin SCC100 or contact your Joy engineer.

JOY

ELECTRICAL
PRODUCTS
DIVISION

1205 Macklind Ave., St. Louis, Mo.

Exec. Offices, Henry W. Oliver Bldg., Pgh., Pa.

SEPARAN AP30



A proportioning pump assembly used to demonstrate the use of Separan AP30 at the preparation plant.

Separan AP30 Clears Wash Water Where Older Coagulants Failed

Recently, a Kentucky coal company found that Separan AP30 successfully cleared wash water *without expensive additions of settling equipment.*

Wash water from the launder contained about seven per cent solids. Flow rate of the feed to the 135-foot Dorr thickener was 1600 gpm.

By allowing solids to settle over the weekend, a clear-water depth of about 28 inches could be attained. However, a clear-water overflow could not be maintained past mid-morning on Monday, the first day of the workweek, even by using 50 pounds of starch per day. Tests showed that both clay and coal fines could be

settled out with only 1.9 pounds of Separan AP30 per hour. A 0.05 per cent solution of Separan AP30 was fed to the effluent through a grid spray positioned at the centerwell end of the launder. *As a result of this treatment, clear water in the thickener was maintained at an average of 42 inches.*

Find out how Separan AP30 can reduce the cost of your coal washing operations. Dowell will arrange—without obligation—a demonstration at your plant. Just contact the Dowell District office at 1918 Highway 41, North, Evansville 7, Indiana. The telephone number is HArrison 5-1353.

Services to the coal industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY



RED BITS



NEW V-R Red Bit cuts down fines

V-R's new MS3 chain cutter bits are now ready for use on cutting machines and universal type miners. The proven chisel bit cuts faster and smoother without drag. Fines are minimized. V-R's lip design holds the carbide tip securely while maintaining fast cutting action. The MS3 Red Bit is another result of V-R's 30 years in carbide research and manufacturing experience. Quality carbide, engineering know-how and competent service assure more tonnage per machine and trouble-free production. Send for catalog VR-488 or call your V-R man today.

Send for
Catalog
VR-488 for
complete
details



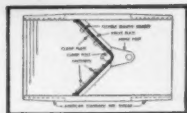
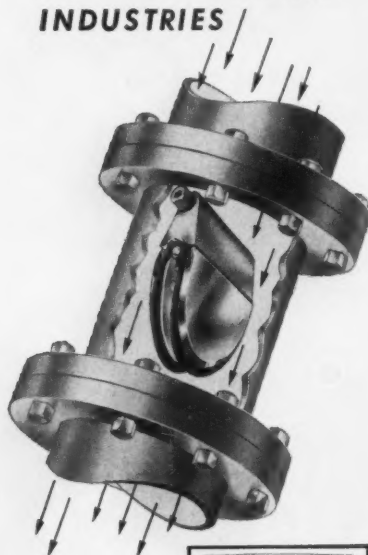
CREATING THE METALS THAT SHAPE THE FUTURE

VASCOLOY-RAMET

878 MARKET STREET • WAUKEGAN, ILLINOIS

M-804

A BETTER PERFORMING CHECK VALVE FOR THE MINING INDUSTRIES



SILENT • SEATLESS • LOW
PRESSURE DROP

Technocheck®

**OUTPERFORMS •
OUTWEARS OTHER VALVES •
COSTS LESS TO MAINTAIN!**

In field service in a wide range of water, gas, air and oil applications, Technocheck's performance and reliability are unsurpassed. Its exclusive design eliminates valve seats. Tight sealing, low pressure drop and long life with low upkeep are some of its important characteristics.

Made in a variety of metals and in Polyvinyl Chloride. Standard and custom models in sizes ranging from 1" to 36".

Write for additional information

Techno Corporation Dept. CA
16 West 5th Street, Erie, Pa.

Preparation Facilities

United States Steel Corp., Mine No. 9, Gary, W. Va.—Contract closed with Kanawha Mfg. Co. for rotary dump and car handling equipment together with crushing and conveying facilities to handle coal to rail loading terminal and rock to truck bin. Capacity is 900 tph.

Slab Fork Coal Co., Mary Gaston No. 2 mine, Slab Fork, W. Va.—Contract closed with Kanawha Mfg. Co. for water clarification circuit consisting of one 24-in Heyl & Patterson cyclone and Dorr 40 ft-diameter static thickener in steel tank. Feed capacity is 1,400 gpm at 30% solid concentration.

Candleton Coal Co., Silver Brook, Schuylkill County, Pa.—Contract closed with The Deister Concentrator Co., Inc., for four Super-Duty Diagonal Deck No. 7 washing tables, for cleaning No. 4 and 5 buck sizes of anthracite.

Cherry River Construction Co., for Maust Coal & Coke Co., Richwood, W. Va.—Contract closed with The Deister Concentrator Co., Inc., for ten Concenco No. 77 Diagonal Deck washing tables, one SuperDuty Diagonal Deck No. 6 concentrating table, one Concenco revolving feed distributor, Model 108, and ten Concenco splitters for cleaning ¼x0 bituminous and for Chance silt sand recovery.

Raleigh Empire Coal Co., Raleigh, W. Va.—Purchase authority issued to The Daniels Co., Bluefield, W. Va., for a complete DMS dense-media precision coal washer, with accessories, to process about 150 tph of coal. Operation scheduled about Sept. 1, 1960.

Freeman Coal Co., Orient No. 3 mine, Waltonville, Ill.—Contract closed with Nelson L. Davis Co. for a Neldec No. 107 processor with standard auxiliary equipment to handle 3x¾-in coal. Plant capacity is to be raised from 150 tph to 225 tph with expected completion for December, 1960.

Joanne Coal Co., Rachel, W. Va.—Contract closed with Western Machinery Co. through Link Belt Co. for installation in Joanne's flotation plant of Wemco Fagergren flotation machines to treat minus ½-mm feed. Capacity is to be 1,609 gpm fine coal slurry at 6.3% solids.

Page Coal & Coke Co., Pageton, W. Va.—Contract closed with Fuel Process Co., for a primary and secondary heavy-media coal washing plant consisting of: a raw coal conveyor; two 5x16 ft Allis-Chalmers pre-wet screens; a 250-tph primary heavy-media washer with accessories; a 75-tph secondary heavy-media washer with accessories; and equipment for crushing, sizing and distributing 6x¾-in coal. Planned capacity is 325 tph.

Coming Meetings

National Safety Congress, 48th annual meeting, Oct. 17-21—Coal Mining Section, Conrad Hilton Hotel, Chicago, Ill.

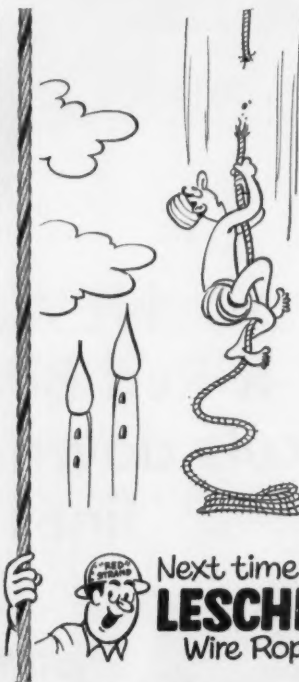
Biennial Symposium on Drilling and Blasting, Oct. 17-19 — Colorado School of Mines, Golden, Colo.

ASME-AIME Joint Fuels Conference, Oct. 24-25 — Daniel Boone Hotel, Charleston, W. Va.

Central Appalachian Sect., AIME, and West Virginia Coal Mining Institute, joint meeting, Nov. 4-5—Greenbrier Hotel, White Sulphur Springs, W. Va.

Penn State 2nd anthracite conference, Nov. 15-16. Technical and scientific aspects of anthracite utilization will be discussed in a variety of papers, including "The Briquetting of Anthracite."

Coal Mining Institute of America, 74th annual meeting, Dec. 15-16—Penn Sheraton Hotel, Pittsburgh, Pa.



LESCHEN WIRE PORTER ROPE DIVISION
H. K. PORTER COMPANY, INC.

Quality . . . the best economy of all



Low per-ton costs—with Sun's simplified underground lube program

Simplify your underground lube inventory by using two Sun products, and what happens? Your machinery runs longer and better . . . maintenance inspections become less frequent . . . and your production costs per ton go down.

Sun 740-A EP makes possible this decrease in inventory and increase in efficiency. It's recommended for *all* points of lubrication requiring *daily* maintenance, except hydraulics. It's a semifluid, extreme-pressure lubricant. It sticks like grease . . .

and flows like oil. Sun 740-A EP resists heat and water, and protects parts against rust and corrosion.

Its full name is Sun Prestige 740-A EP Universal Mining Machinery Lubricant. And, the only teammate it needs is a Sun hydraulic oil.

Your Sun man can tell you the whole story. Or write to Dept. ME-10, SUN OIL COMPANY, Phila. 3, Pa. In Canada: Sun Oil Company Limited, Toronto and Montreal.



MAKERS OF CUSTOM-BLENDED BLUE SUNOCO GASOLINE





gains 100,000 votes of confidence!

During 1960 we will ship our 100,000th Wedge-Wire Kleenslot screen.

Call it popularity, call it efficiency, call it good design. Whatever you name it, Wedge-Wire has that vital quality that builds performance into screens and confidence into customers.

Kleenslot preparation screens are designed for vibrators or stationary applications for dewatering, screening, washing, extracting, filtering or sizing applications.

All screens are custom manufactured to your application and are available in many sizes, metals and finishes.



WEDGE-WIRE CORPORATION
Wellington, Ohio

send for our free catalog

mining • oil • abrasives • foods • chemicals •
cements • phosphates • SCREENS FOR INDUSTRY



News Roundup (from p 28)

Two Pittsburgh district firms, The Connellsville Mfg. & Mine Supply Co., Connellsville, Pa., and Femco, Inc., Irwin, Pa., will supply a major part of the equipment.

Connellsville will design, build and install semi-automatic material-handling equipment, including a coke pusher, leveler, larries, conveyor, quencher and mud trucks. With this equipment, says Russell L. Lepley, Connellsville vice president and general manager, the plant can produce 1,000 tpd of coke at a conversion cost of about 60¢ per ton.

Femco will supply controls by which an operator on the leveling machine can position larries beneath the weigh-bins for loading, move them into charging position at the ovens and unload their charges by conveyor. Other controls, operated from the conveyor, will position and operate the coke pusher on the opposite side of the oven, shift cars into position to receive the coke, move them over unloading bins and actuate a conveyor which will carry the coke to a preparation plant for crushing.

Mitchell-type ovens which combine the rectangular shape of byproduct ovens with the non-recovery simplicity of the early beehive units, will be built at the plant. Prime contractor on the job is Silas Campbell Contractors, Inc., Harlan, Ky.

Plan Furnace

Pittsburgh's future as a steel center has received a vote of confidence from the United States Steel Corp., which announced July 28 that it would build an ultra-modern blast furnace at Duquesne Works, on the Monongahela River, 10 mi south of the city.

The furnace, which will ultimately replace certain older, smaller furnaces in the area, will help U. S. Steel meet its projected long-range needs for molten iron to supply steelmaking furnaces in the Monongahela Valley. The furnace will have features enabling its use in research studies into blast furnace operating problems.

Scheduled for completion in 2 yr, the furnace is expected to produce about 850,000 tons of molten iron annually—far more than any other blast furnace in the Pittsburgh district, according to the company. The unit, though completely new, will bear the same designation, No. 6, as an existing furnace which will be dismantled as the first step in the construction project.

Construction of the new unit will mark another step in the rebuilding of the Duquesne Works. Presently nearing completion are three primary rolling mills, which will give Duquesne high-speed facilities for rolling blooms, slabs and

NEW



Austin AP-20D plug type cutter bit

Austin *Snap-Fit* Cutter Bits boost production... slash down-time

Austin series 20 cutter bits snap instantly into place . . . provide a virtually vibration-free cutting edge . . . are easily snapped out and replaced in minutes instead of hours.

Because series 20 bits are precision manufactured, they penetrate faster and provide peak cutting performance far longer than regular tools. 100% machined shanks are held so firmly in blocks that vibration is virtually eliminated. Positive bit and pin seats further assure tight, wobble-free fit.

Austin bits also greatly prolong block and chain life. Due to their precision manufacture, they produce the same length cutting edge from every block. Thus, each bit does an equal share of work and uneven wear is prevented.

For more of the series 20 cutter bit story, call your Austin representative today.

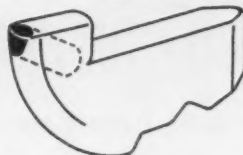
A-1329A



AUSTIN
POWDER COMPANY
CLEVELAND 13, OHIO

3 precision-machined models for
longer life . . . faster bit changes

AP-20D



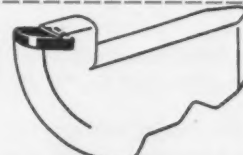
Entire surface of carbide insert with exception of cutting edge is brazed to shank.

AP-20



Three sides and extreme end of carbide insert in end mill type bit are brazed to shank.

AP-20R



Carbide insert of full radius bit is brazed in special alloy steel shank for strongest possible support.

Bellaire, O. • Brookville, Pa. • Chapmanville, W. Va. • Charleston, W. Va. • Coaldale, W. Va. • Evansville, Ind. • Grundy, Va. • Hazard, Ky. • Madisonville, Ky. • Masontown, W. Va. • Matewan, W. Va. • Mt. Hope, W. Va. • Waynesburg, Pa.



TEXACO SIMPLIFIED UNDERGROUND LUBRICATION

**Fewer lubes needed to keep all your
underground equipment in top working order**

It's true! With Texaco's new Simplified Lubrication Plan, you'll use far fewer lubes underground, gain many important benefits. For example—

Increased efficiency. With fewer lubes, there is less danger of misapplication, less chance of lubrication points being overlooked. Properly lubricated equipment always runs better.

Less unscheduled downtime. The right lubricant applied on schedule assures full production from all equipment.

Simplified purchasing and storage. Less money tied up in lubricant inventory. Far less danger of lubricant contamination. Less purchasing paperwork.

Get full details from your Texaco Lubrication Engineer.

Your Texaco Lubrication Engineer will be glad to show you how Texaco's Simplified Lubrication Plan will fit into your operation and save you time and money. Call the nearest of the more than 2,300 Texaco Distributing Plants, or write Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

Tune In: Texaco Huntley-Brinkley Report, Mon. Through Fri.-NBC-TV

TEXACO



Throughout the United States

Canada • Latin America • West Africa

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

IN LESS THAN TWO YEARS SINCE ITS INTRODUCTION

—the most impressive acceptance
ever accorded a new lamp model
by the mining industry!



WHEAT National MODEL ELECTRIC CAP LAMP

—and here are the bedrock reasons why:

A PERFECT SPOT EVERY TIME

Never before has it been so easy for the miner to get the spot he wants. A turn of the switch knob and there it is —and right, every time! A perfect brilliant spot is equally obtainable with either of the two full-power identical filaments.

30% MORE LIGHT

Brighter light than ever, at no increase in battery size or weight! The greater light output of the Wheat National is maintained at high levels during and beyond the entire working shift as photometer tests prove.

TRUE AUTOMATIC CHARGING

... and the only true automatic! With the WHEAT

systems, lamps are charged in self-service racks uniformly and automatically regardless of their individual degree of charge or discharge, number of lamps or length of work day or week. Each lamp takes only the current needed to keep it charged, each lamp can be left in the rack for days and cannot overcharge. Every miner gets a fully-charged lamp without manual attention.

SIMPLEST MAINTENANCE FOR LOWEST COST

Ordinary cleanliness, weekly watering and occasional bulb replacement are the simple maintenance requirements of the Wheat National. There are no covers to open, no terminals to clean, no valves to free, no cells to re-solution, no lamps to rack. Wheats need a minimum of manual attention.

Write for WHEAT Electric Cap Lamp Bulletin No. 593—free on request.

**National Mine
Service Company**



Koppers Building - Pittsburgh 19, Pa.

ALABAMA DIVISION
Birmingham, Ala.
BEMECO DIVISION
Beckley, W. Va.
WESTERN DIVISION
Price, Utah

ASHLAND DIVISION
Ashland, Ky.

DISTRIBUTING DIVISIONS:

ALL-STATE DIVISION
Logan, W. Va.
KY.-VA. DIVISION
Jenkins, Ky.
WESTERN KY. DIVISION
Madisonville, Ky.

MANUFACTURING DIVISIONS:

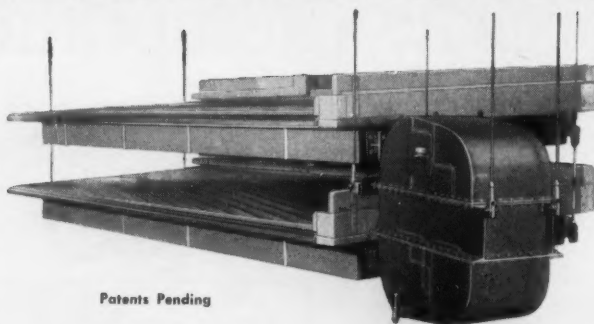
CLARKSON DIVISION
Nashville, Ill.

ANTHRACITE DIVISION
Mt. Carmel, Pa.
MOUNTAINEER DIVISION
Morgantown, W. Va.
WHITEMAN DIVISION
Indiana, Pa.

GREENSBURG DIVISION
Greensburg, Pa.

IN CANADA:

NATIONAL MINE SERVICE (CANADA) LIMITED, Elliot Lake, Ontario



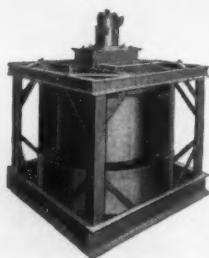
Patents Pending

Double the Capacity of Your Fine Coal Washing Section

The twin deck CONCENCO® 77 coal washing table actually prepares twice as much coal per square foot of floor area as the finest single deck table on the market. Two identical decks in floating suspension are operationally synchronized by one smooth running head motion to give exactly the same efficiency and output on each deck as you formerly expected from your single deck table. And, because you use a motor of the same horsepower, the economy is obvious.

Furthermore, as concerns your cleaning section expansion, any new building program can be long delayed. And when it is eventually undertaken, the new construction can be lighter, less costly, because of the reduced impact to the supporting structure.

For full information, send for Bulletin 77.



CONCENCO
Feed Distributor

While unexcelled for feeding coal washing tables, the CONCENCO Feed Distributor effectively provides an accurate splitting of feed into any desired number and proportion of parts to feed circuits or machines in battery for their greater overall efficiency. It is a heavily fabricated all steel machine with motor drive requiring 1 h.p. or less in operation.

**THE DEISTER★
CONCENTRATOR
COMPANY**

**CONCENCO
PRODUCTS**

★ The ORIGINAL Deister Company ★ Inc. 1906
909 Glasgow Ave. • Fort Wayne, Ind., U.S.A.

News Roundup (Continued)

billets. Already in operation are such installations as a fifth furnace in the electric-furnace steelmaking shop and one of the most complete metallurgical testing laboratories in the steel industry.

E. H. Gott, executive vice president, production, said, "We at United States Steel believe that the construction of this furnace, which will be the first built by the corporation in this area for many years, demonstrates firm confidence that Pittsburgh will continue to play a dominant role in the steel industry of this country."

Cut Rail Rates

Motor truck competition has forced several railroads to cut their rates for hauling bituminous coal to industrial plants in the Buffalo, N. Y., area. Local railroad executives said this was the first time they had to cut rates to compete with trucking.

Trucking of bituminous to some large industrial users around Buffalo got under way late last year and has picked up steadily in volume. Most of the coal comes from mines in Pennsylvania and West Virginia. "They started to take the market away from the railroads," one railroad executive commented. "The cut is for the purpose of halting this erosion in our revenue."

The rate slash applies to bituminous for other than coking or metallurgical purposes. The reduction amounts to 35c a ton, and for customers receiving more than 1,000 tpd, 60c a ton. It is estimated that the 35c-a-ton cut amounts to about 11% of the transportation cost and the 60c reduction 17 to 18% of the total cost.

The larger users of bituminous coal who qualify for the 60c rate reduction include Niagara Mohawk Power Co.'s Huntley Station and Hooker Chemical Co. The 35c cut applies to a wide range of industry. One businessman judges the cut will save local industry more than \$1 million a year in transportation costs.

Last year, 7,930,498 tons of soft coal were brought into Buffalo, of which, 5,479,040 tons were transported by rail and 2,451,458 by water, it is estimated. Of the 5,479,040 tons brought by rail, roughly 3,500,000 tons went to users who would qualify for the new rate cut.

Bureau Milestone

The Bureau of Mines marked its fiftieth anniversary recently after a half-century of tremendous growth.

The bureau now has 4,000 employees against 124 in 1910 and spends nearly \$37 million compared with \$536,400 in its first year. Bureau officials point with

New milled-out center design
allows faster penetration,
controls dust problems.

Longer cutting edge means
increased bit life, complete
use of all the carbide.

Carmet SS Style Roof Bolting Drill Bit

FREE-FLOWING BIT DESIGN

CUTS ROOF HOLE DRILLING TIME 25 PERCENT

**NEW CARMET
MINING TOOL CATALOG
NOW AVAILABLE FROM YOUR
CARMET DISTRIBUTOR**

Brace-Mueller-Huntley, Inc.
Offices: Buffalo, Rochester & Syracuse, N.Y.
Carbon Transfer & Supply Co., Helper, Utah
Carlsbad Supply Co., Carlsbad, New Mexico
Consolidated Supply Co., Picher, Oklahoma
Crandall Eng. Co., Inc., Birmingham, Ala.
Drillmaster Supply & Mfg. Co., Evansville, Ind.
Gladstein Co., McAlester, Oklahoma
Marion Mine & Mill Sup. Co., Whitewell, Tenn.
McCombs Supply Co., Jellico, Tennessee
Oglebay, Norton Mine Supply Div.,
Offices: St. Clairsville, Ohio;
& Johnstown, Pa.
Persinger Supply Co., Williamson, W. Va.
Persinger's Inc., Charleston, W. Va.
Union Supply Co., Denver, Colorado
U. S. Steel Supply Co., Pittsburgh, Pa.
W. B. Thompson Co., Iron Mountain, Michigan



The newly revised 5th Edition of the Carmet Mining Tool Catalog contains application data and specifications on the complete line of Carmet Mining Tools, including a complete section on grinding and reconditioning. For your copy, write Carmet Division, Allegheny Ludlum Steel Corporation, Detroit 20, Michigan.

ADDRESS DEPT. CA-9

The outstanding performance of Carmet's Style SS roof drill bit has been proven over the years in tests and under actual operating conditions in mines throughout the country. This sturdy mining bit consistently drilled faster, cleaner and more accurately than others on the market.

Now, the newly modified milled-out center design of the SS Bit allows freer passage of large cuttings for even greater drilling speeds. It can save you up to 25 percent drilling time. The problem of dust control at the face is practically eliminated.

The harder, more wear-resistant Carmet Carbide grades used on all Carmet mining tools guarantee a longer operating life for the SS Bit and greater economy of operation for you. Heavy alloy steel support under the cutting tip insures against carbide fracture and strong prongs insure against tool breakage. SS Bits are available in the following sizes: 1½, 1¾, 1½, 1¾ and 1¾.

See your Carmet Distributor today for more information on the SS Style Roof Bolting Drill Bit . . . and also, ask him about Carmet's complete line of mining tool bits.

WSW 7192

The Original DOUBLE-BONDED Carbide Cutter Bit

CARMET





966 TRAXCAVATOR—2¾ CU. YD. STANDARD BUCKET • 140 HP Cat D383 Diesel Engine, turbocharged to give extra efficiency and quick response for machine drive and bucket hydraulics. • 57" reach at 7' dumping height... maximum lift—12' 10". • LIVE ACTION hydraulics for tough excavation, fast lift and dump. • DUAL-RATIO steering for

work and highway travel. Operator shifts lever on steering column to select work or travel ratio. For work cycles and quick turns, one-half swirl of steering wheel puts Traxcavator in maximum turn. For travel ratio, 2 twists of wheel are required for sharpest turn. • DIRECT ELECTRIC STARTING standard. Gasoline starting engine optional.

CATERPILLAR ADDS 2¾ yd. and 1¼ yd. MACHINES THE 966 and 922

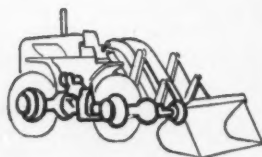
Cat's first wheel loader, the 2 yd. 944, introduced this spring, has already gained an acceptance unmatched in machinery history. Now there's a full line and one for your job: the 966, 2¾ yd., 140 HP, for high production jobs where you measure time in tons of material loaded; the new 922, an 80 HP, 1¼ yd. Traxcavator with all the safety and fast operating features of the two bigger machines. The 922 can give you speed, versatility and production to handle all those jump-and-run jobs.

Have you seen a 944 working in your area? Have you asked the owner about its dependability and favorite fea-

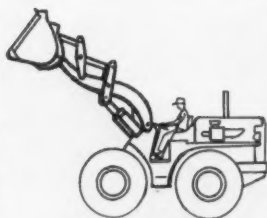
tures? He's probably got some mighty impressive answers. And frankly it's understandable why these Traxcavators have made a name for themselves so quickly. There is a 7-year history of thorough testing and development behind these new machines. They come from the manufacturer with 23 years' loader experience and 20 years of wheel tractor know-how.

Look at the features that are on all 3 loaders: clean, open cockpit, easy to get into; bucket arms up front away from the operator; well-balanced design; long dumping reach (nearly 5' on the 966), soaring lifts to get over truck sides

Both the 966 and the 922 have all the features proved in the field by the popular 944 Traxcavator



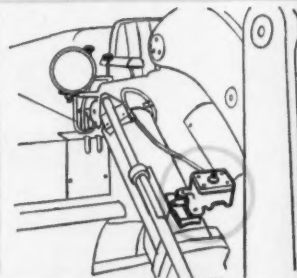
POWER SHIFT TRANSMISSION with torque converter gives smooth, instant shifting for 1st-2nd speeds—forward and reverse. In travel range, the machine is in 2-wheel drive for high-speed roading. A shift to work range automatically puts power to all 4 wheels for full traction.



OPERATOR SAFETY Lift arms and cylinders are all forward of the cockpit...giving complete freedom of movement. Visibility is excellent at all times. It's easy and safe to get into a Traxcavator from either side...up 3 wide steps...no ladders to climb. Tires are covered by fenders.



OPERATOR CONVENIENCE Bucket controls are on the right side, leaving the left hand free for machine operation. The forward-reverse lever is mounted on the steering column for finger-tip shifting without decelerating, steering is power boosted with dual-ratio on the 966.



AUTOMATIC BUCKET KICK-OUT DEVICE allows faster cycles. After loading bucket, pull lift lever to up position. Bucket goes up to dumping height and control kicks into hold position automatically. While lowering bucket after dumping, set tilt lever, and bucket is positioned for digging.



922 TRAXCAVATOR—1½ CU. YD. STANDARD BUCKET • 80 HP. Your choice of compact 4-cylinder Caterpillar turbocharged Diesel Engine (uses low-cost furnace oil without fouling) or 6-cylinder gas engine with large cubic inch displacement for long life and sustained power. Use the type of engine that matches your other equipment. With

either engine you have one source of warranty responsibility... one source of parts and service... your reliable Caterpillar Dealer. • Long 40¾" reach at 7' dumping height... maximum lift of 11' 2". • For top production in its class, the new 922 Traxcavator has all the safe, fast operating features of the bigger machines.

TO ITS WHEEL LOADER LINE...

TRAXCAVATORS

and railroad cars; automatic bucket controls to speed cycles; dependable Cat Diesel power with optional gasoline engines on two smaller models; Cat power shift transmission to change speed and direction with a finger touch, without decelerating; and service features like the dry-type air cleaner and unitized construction.

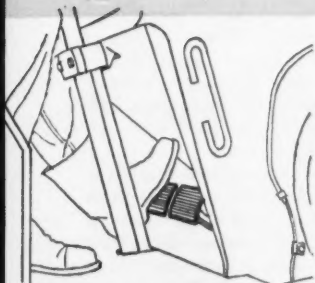
There's one man in your area with all the facts — your Caterpillar Dealer. Get in touch with him now. Ask for a demonstration — once you watch one of these machines you'll want it!

Caterpillar Tractor Co., General Offices, Peoria, Ill., U. S. A.

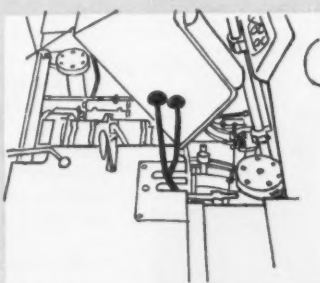
CATERPILLAR

Caterpillar, Cat and Traxcavator are Registered Trademarks of Caterpillar Tractor Co.

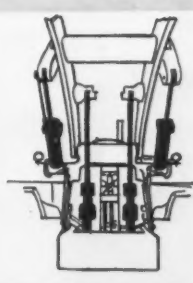
**TRAXCAVATORS
ARE MAKING OTHER
LOADERS OBSOLETE**



DUAL BRAKES The left brake pedal neutralizes the transmission as it stops the machine. This transfers extra power to the bucket... assuring full loads even in tough material. The right brake pedal stops the machine with the transmission engaged... giving full control for roading downhill.



EASY SERVICE ACCESS The seat tips forward for quick access to transmission oil filter and control linkage adjustments. Unit construction allows independent removal of engine, transmission, other major components. The dry-type air cleaner can be serviced in about 5 minutes.

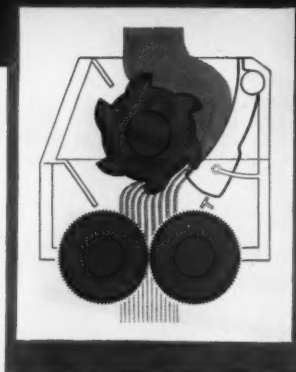


LIVE-ACTION HYDRAULIC SYSTEM Plenty of power from the engine is always available to the husky vane-type pump that supplies the pressure and volume for fast bucket action. Control valves are enclosed in the steel reservoir for complete protection. System is full-flow filtered.



AVAILABLE WITH A COMPLETE LINE OF ATTACHMENTS, including special buckets for light or heavy materials, lift forks for lumber and palletized materials, and the exclusive side dump bucket. A fiber-glass cab is also available.

IMPROVED TWO-STAGE CRUSHER



More uniformly-sized product results from this two-stage combination: Large-diameter toothed roll does the primary work against a curved crushing plate; with double rolls performing the secondary reduction.

The McLanahan Triple Roll Crusher . . . which reduces run-of-mine coal and open pit feed to $\frac{1}{2}$ " and smaller in a single pass . . . has been refined to make it even more adaptable for high-tonnage operations. Rolls now are gear driven, and larger size rolls are available.

NOW AUTOMATIC TOGGLES, an optional feature, protect against tramp iron. Attached to the movable secondary roll, the Toggles open to pass uncrushable material, then immediately return the roll to the original setting—without stopping the crusher.

Ask for New Bulletin TR-20.

McLANAHAN

TRIPLE ROLL CRUSHER

News Roundup (Continued)

pride to the fact that only about 32 coal miners are killed each year in major disasters compared with 364 during the bureau's earlier days, an outstanding record. The bureau employs hundreds of inspectors who examine the nation's coal mines and it issues dozens of pronouncements about mine safety.

Interesting is the fact that the bureau has expanded well beyond its initial primary involvement with coal mining. Today it owns and operates five helium plants, runs and experimental blast furnace near Pittsburgh, conducts basic research on the nature of fire and is deeply involved in research in the field of high-purity metals.

In mobilizing its research efforts, the bureau attempts to move into those areas where private industry either cannot or will not undertake the job, and is now deeply involved in space age work.

In addition to its own programs, the bureau also receives funds from other government agencies, including the Atomic Energy Commission and the armed services, to perform specific research work. Private companies such as United States Steel Corp., Union Carbide Corp. and Hercules Powder Corp. have partially underwritten the cost of various research efforts.

The results of research performed in conjunction with private industry are made available to all interested parties, a policy that contrasts with those of many private non-profit research organizations.

Bureau researchers recently announced they have discovered that the rare chemical, coronene, can be produced during the conversion of certain American coals to pipeline gas.

Heretofore the scientific world had been able to obtain coronene only by complicated processes, chiefly the hydrogenation of coal into liquid fuels, but coronene never had been detected in American coals.

The bureau's chemists encountered the characteristic needle-like crystals of coronene while using a simpler hydrogenation technique for making pipeline gas. The discovery occurred while tests were being run on powdered anthracite from Luzerne County, Pa.

Recovery of coronene from the Pennsylvania anthracite was at a rate of 1 lb per 1,000 lb of coal. Since coronene never has been used commercially in the United States and because its market cost of \$2 to \$3 a pound places it in an unfavorable competitive position with other dye bases, the bureau does not forecast a rosy future for coronene in the next few years. But it was pointed out that should the production of pipeline gas from anthracite become commer-

News Roundup (Continued)

cially feasible, the simultaneous recovery of coronene could help underwrite the cost of gasification.

Pass Bill

President Eisenhower signed a tax bill early in July which includes an extensively revised definition of "mining" for depletion purposes, applicable to tax years beginning after Dec. 31, 1960.

Effect of the bill, however, was to preserve the status quo of coal's definition of "mining" for computing percentage depletion for all taxable years. The bill essentially extended the normal 52% corporate tax rate and certain excise taxes. The Senate added an amendment intended to cut off depletion allowances based on finished or manufactured products rather than the value of raw material.

Compromise language was drafted to preserve existing depletion rights of coal and other mine owners and operators. The bill makes it plain that the owner of an "economic interest" in coal in place will continue to be entitled to the entire allowance for depletion even if the coal is extracted by other persons.

Joy in Move

Joy Mfg. Co., Pittsburgh, has announced it will enter the business of making earth and coal augers through the purchase of Compton, Inc., Clarksburg, W. Va.

C. E. Compton, president of Compton, will continue in that position for the firm, which will be operated as a wholly-owned subsidiary of Joy. Joy has also entered into an arrangement with Mr. Compton under which they will jointly undertake development of a new system for the continuous mining of coal in seams less than 36 in high.

To date, says Joy, no satisfactory system or machinery has been developed for high-production continuous mining of the valuable coals which lie in these thin seams.

Disaster Report

The United States Bureau of Mines has finished its official report on the disaster which occurred March 8 at Holden mine, No. 22, of Island Creek Coal Co., Holden, W. Va., taking the lives of 18 men.

The bureau concluded that the mine fire was probably caused "when electric arcs or flame from the trolley wire ignited dry wooden crossbars and/or timbers on the haulageway."

The investigation was made with the cooperation of West Virginia authorities, the UMWA and Island Creek Coal Co.



BEE-ZEE

SCREENS THAT TURN PROBLEMS INTO PROFIT

■ Tough jobs call for tough screens . . . screens that have been carefully, intelligently engineered. By making tough jobs look easy, Bee-Zee Screens make you money. They're all-stainless-steel and all-welded, with rods spaced precisely by electronic control. The equipment you own and operate right now can be equipped with Bee-Zee Screens—as shown above or in any of the rod shapes shown below. Wire, write or phone Galesburg DIckens 2-5154 collect.

BIXBY-ZIMMER
ENGINEERING CO.

190 Abingdon St., Galesburg, Ill.



Bee-Zee Screens in a wide variety of shapes and sizes meet the needs of leading firms in the coal, minerals, quarry, oil, food, chemical, plastic, brewing, distilling, pulp and paper, rubber and other industries.

8-yard P&H 1855 Stripper Shovel combines long reach with mobility and fast operating cycles.

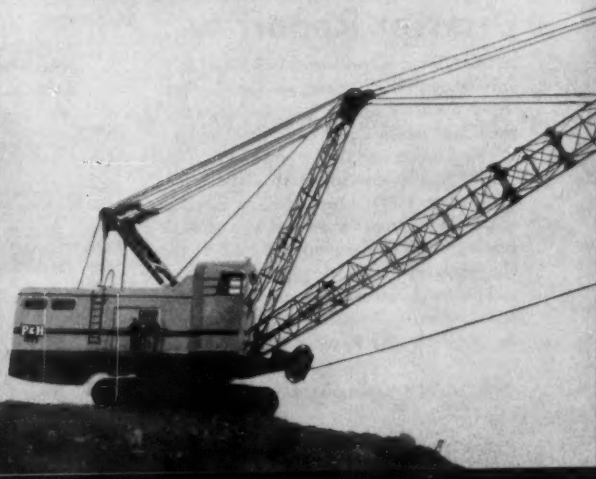


MAGNETORQUE® drive puts more material into the dipper—faster

In Bituminous Coal—P&H 1855 Stripper Shovel puts more material in the dipper faster on every pass. Owned by Tri-State Corp., Steubenville, Ohio.



In Anthracite Coal—P&H 1855 Dragline combines long boom, large bucket and fast operating cycles for profitable production. Owned by Sullivan Trail Coal Co., West Pittston, Pa.





with every pass

Because of Magnetorque Drive P&H 1855 GETS UP TO 25% FASTER OPERATING CYCLES...

*...outproduces any stripper
shovel in its class*

Prime reason for the faster stripping ability of the 1855 is Magnetorque drive—the most productive work-motion drive known for electric mining excavators. This advanced P&H drive electro-magnetically transmits the full power of an A.C. motor direct to hoist, swing and propel motions—without motor generator set conversion to D.C.

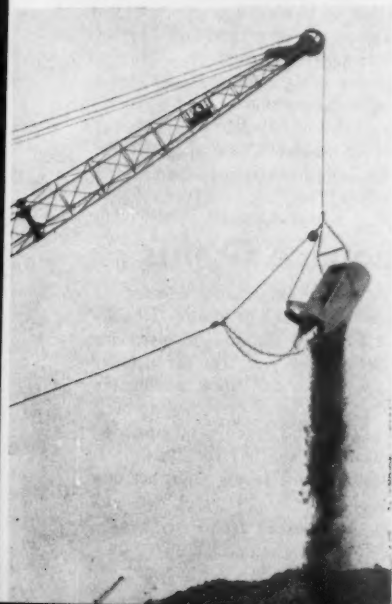
Results: Up to 30% higher bail pull, more uniform dipper speed in the bank with faster swing motion—important factors which produce up to 25% faster, well balanced operating cycles.

The 1855 is rated up to 8 cubic yards as a stripper shovel, with a choice of boom lengths up to 70 ft. and dipper handle lengths up to 56 ft.—all fabricated of ultra-high-strength T-1 steel. The machine is also fully convertible for long range dragline service. Unmatched for maneuverability, it is the largest excavator mounted on a single pair of crawlers.

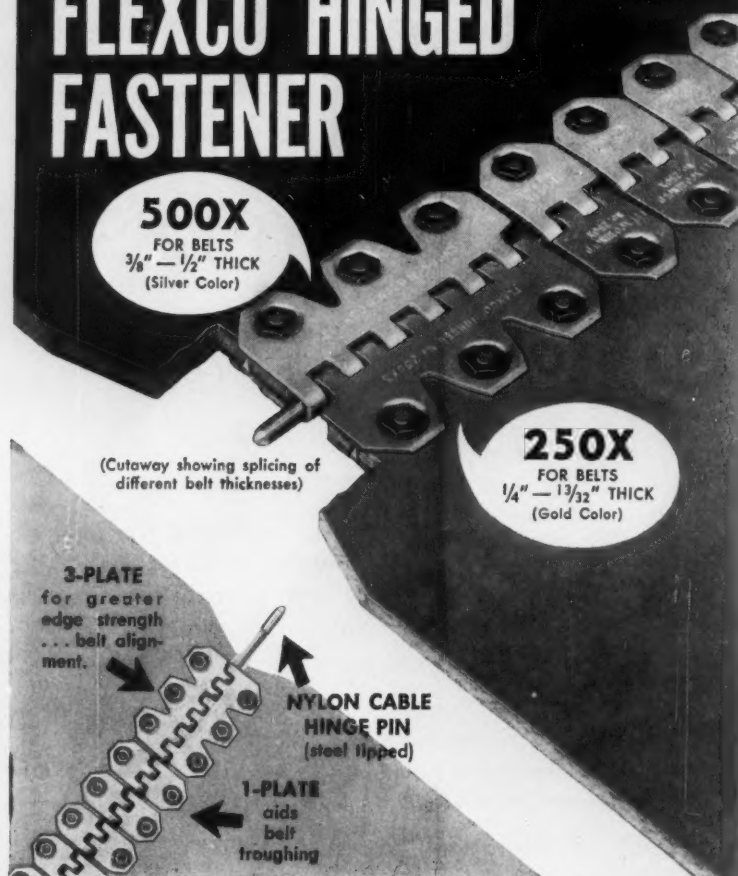
The shovel crowd of this giant electric develops enormous thrusting power with rapid response, for it is powered by a D.C. motor driving the exclusive P&H multiple-thread hour-glass worm mechanism.

Harnischfeger is the only shovel manufacturer which makes its own electrical as well as mechanical components—all matched to work together and *designed specifically for electric shovel service*. Write Dept. 618A, Harnischfeger Corporation, Milwaukee 46, Wis.

HARNISCHFEGER
Milwaukee 46, Wisconsin



NOW...CONNECT BELTS OF DIFFERENT THICKNESSES WITH ONE TYPE OF FLEXCO® HINGED FASTENER



CUT FASTENER APPLICATION TIME IN HALF BY USING THE NEW . . .

- FLEXCO SPEED TOOLS with an impact wrench.
- FAR-PUL BELT CLAMPS—the easiest, quickest way to pull belt ends together.
- ALLIGATOR WIDE BELT CUTTERS—assures straight cut.
- EASY "CLIP" METHOD—newly designed clips hold fasteners in correct position while nuts are being run down—no other alignment tool required (clips included with every carton joint).

HANDY PACKAGING



Complete splices of 500X and 250X fasteners for any given width of belt available in cartons (carton includes pins, bolts, nuts and clips).

ORDER FROM YOUR DISTRIBUTOR, or write for bulletin 500X.

Flexible **STEEL LACING COMPANY**
4638 LEXINGTON STREET • CHICAGO 44, ILLINOIS

News Roundup (Continued)

Recommendations to prevent similar disasters included the following:

"At least two separate and distinct travelable escapeways should be provided from each working section to the surface. The escapeways should be kept in safe condition for travel and reasonably free from falls, standing water and other obstructions, to the extent that men can escape quickly in an emergency.

"In the developing of multiple entries, consideration should be given to the separating of multiple intake, airways with a continuous line of stoppings, so as to provide two separate and distinct escapeways in the event of a fire in intake air.

"Direction signs should be posted conspicuously at all points of intersections with other passageways to indicate manways and designated escapeways.

"Underground workmen should be thoroughly trained in firefighting procedures and fire drills should be held regularly. What to do in case of a fire should be written instructions containing all pertinent information and procedures and should be posted conspicuously for easy reference by all employees.

"Consideration should be given to providing auxiliary means of underground communication to be used in an emergency or in case of power failure. Telephone lines could be trenched or placed in conduit, and/or a storage-battery powered trolley-phone system could be provided on the locomotives.

"Haulage entries should be examined frequently by authorized personnel to assure that ample vertical clearance is provided between moving equipment and power wires. When inadequate vertical clearance is present along haulageways, corrective measures should be taken as rapidly as possible.

"All underground personnel should be instructed on procedures that should be followed in the event of a disaster underground. These instructions should include information on barricading, especially information on when, where, and how to erect barricades.

"Plans for pillar mining should strive for complete extraction of coal so as to provide good roof falls and prevent areas from taking weight. Every effort should be taken during pillaring to remove all blocks of coal."

Announce Grants

Ten students have been selected to receive Sahara Coal Co. forestry scholarships at Southern Illinois University for the 1960-61 school year. The list includes seven freshmen and three sophomore students.

The scholarships, part of 60 provided by the company in 1957 for distribution over a 4-yr period, nearly cover in-state

News Roundup (Continued)

tuition and fees for one year at SIU. Currently, the awards are going to college freshmen and sophomore applicants. To be eligible, freshmen must rank in the upper one-half of their high school class and have at least four units of high school science and mathematics, two of which must be mathematics. To continue receiving the scholarships throughout the year, students must maintain satisfactory scholastic standards.

Freshmen selected to receive the awards are: John B. Casteel, Oakwood; Larry Haffner, Good Hope; Paul Murphy, Monmouth; Randall A. Roberts, Jewett; Keith E. Schultz, West Chicago; Dwight A. Smith, Virden; and James Spezia, Carbondale. Sophomores selected are: James E. Bell, Chrisman; Kenneth Runyon, Olney; and Albert Willison, Tuscola.

One-hundred and one students enrolled in the SIU School of Agriculture's 4-yr forestry program last year, according to Dr. Neal Hosley, chairman of the Forestry Dept. The department graduated its first students this year.

Gas Process Cuts Coke Use

A new technique in blast furnace operations resulting in sizeable coke savings has been developed at Colorado Fuel & Iron Corp.'s Pueblo, Colo., plant, according to the firm.

John Carlson, superintendent of the Blast Furnace Dept., says experiments begun in November, 1958, have resulted in the application of natural gas as a raw material in iron production. The use of natural gas decreases the amount of coke required to produce each ton of iron, he noted, adding that the value of the coke saved is much greater than the cost of the gas.

Formerly, coke was the only fuel used in the furnaces. The coke is charged with the ore and is consumed by a blast of hot air which enters the furnace through several openings called tuyeres. The new method developed by CF&I has natural gas injected into the hot blast just before it passes into the furnace. The gas reacts with the air and coke, releasing heat and forming gases which reduce the iron from the ore.

The rate of consumption of coke is thus slowed down, the report said. By adjusting the proportion of ore and coke in the charge, it is possible to maintain the furnace operation at a lower coke rate.

A workable method of injecting the gas was developed and tested between November, 1958, and February, 1959, noted CF&I. A larger gas line was built and put into service in June, 1959. Enough natural gas was then available to show a sizable coke saving.



Takes the Crushing Problem DOWN TO SIZE!

YOU BENEFIT...

By Control of Top Size — Crushing to size in one operation eliminates recirculating load . . . saves time and equipment . . . increases overall plant capacity.

By Less Fines — More saleable coal in stoker sizes means more dollars per ton . . . if crushing prior to washing, fewer fines means lower washing costs.

By Flexibility . . . Can handle larger lumps and frozen coal . . . hand wheel adjustment allows you to fill any order down to 3/4" top size . . . orders heretofore uneconomical to fill are now yours.

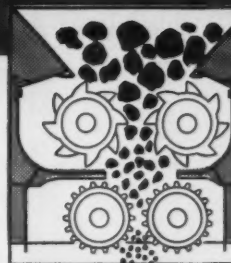
By Dependability . . . Ever-increasing list of satisfied users.

By Economical Operation . . . Less maintenance . . . Less H.P. per ton of crushed coal . . . One Crusher . . . Lower initial investment . . . No wasted labor in adjusting crusher.

YOUR CUSTOMER BENEFITS...

By Control of Top Size . . . Less unburnt coal in ashes . . . More BTU output per ton . . . Lower ash handling costs . . . Greater overall utilization.

By Less Fines . . . Simplifies unloading . . . increases boiler efficiency.



Uniformity in size consist of GUNDLACH crushed coal eliminates customer complaints, gives customer satisfaction, and increases production.

If you have a crushing problem, you'll find a GUNDLACH representative as near as your telephone.

OUR REPRESENTATIVES AT YOUR SERVICE

ANDREW M. GARDNER, 626 Park Lane, Greensburg, Pa., TEmpLe 4-4346 • MARSHALL EQUIPMENT CO., P.O. Box 1367, Huntington 15, W. Virginia, JA 3-8691 • CLYDE E. CLARKSON, 4831 E. Harvard Lane, Denver, Colo., SK 6-5277 • J. SCHONTHAL & ASSOC., INC., Suite 309, 224 S. Michigan Ave., Chicago 4, Ill., WA 2-8350 • A. R. AMOS COMPANY, 713 Commercial Trust Bldg., Philadelphia, Pa., RI 6-3675 • RICHARD M. WILSON, 27 Oak Park, Wheeling, W. Virginia, Woodsdale 586.



T. J. GUNDLACH MACHINE CO.

P. O. BOX 283 • BELLEVILLE, ILL.

Division of J. M. J. Industries



Let us prove we can cut your bit costs

You be the judge

Let us show you, by actual demonstration, how Kennametal Bits can increase production and lower your mining costs. Just call your Kennametal Representative and he will put the wheels in motion.

First, he will come to your mine and view underground conditions, to determine the Kennametal Bit that will give the best results. At your convenience, he will provide the bits and assist in their installation. He will remain on hand during the test, to help in every possible way. Upon its completion, he will review the test data with you.

We know the results will favor Kennametal Bits . . . no matter what other bits you may now be using. But we want you to judge for yourself. And

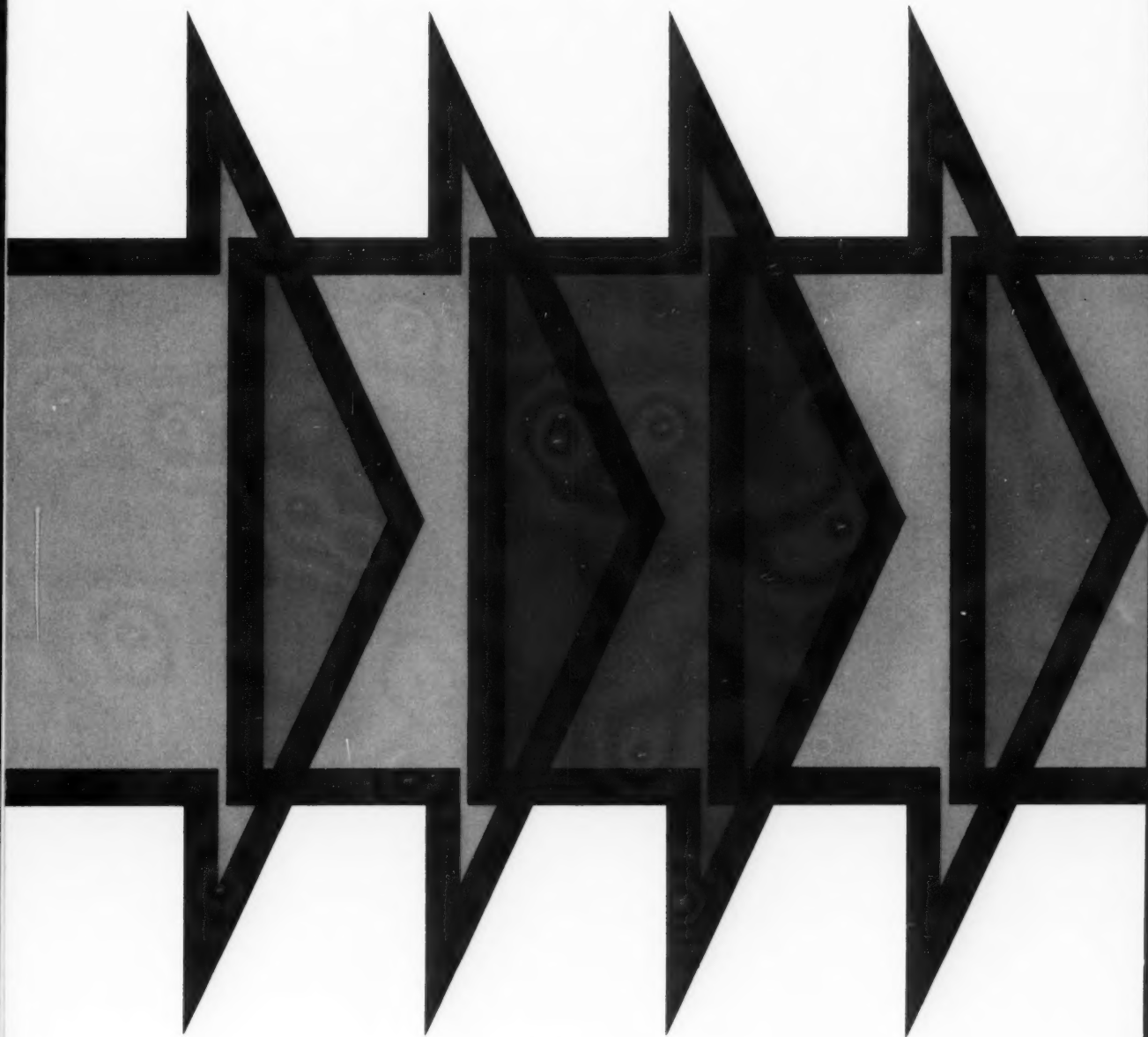
you can't compare bits on price . . . *the difference shows up in performance.*

Why not try it? You have nothing to lose. A test-demonstration will cost you nothing extra. If you decide the test has proved Kennametal Bits superior . . . then you pay for the bits used in the test. But if you think the test does not favor Kennametal, you only pay for the Kennametal Bits at your former bit cost. So, regardless of the results, you will pay no more than your present bit cost. Any *savings* we produce for you over your present average bit cost are clear profit for you.

Judge for yourself! Call your Kennametal Representative or contact us direct. KENNAMETAL INC., Mining Tool Division, Bedford, Pennsylvania. Phone: Bedford 755. 33533



INDUSTRY AND
KENNAMETAL
... Partners in Progress



FROM GREAT LAKES STEEL



TWO NEW STEELS—HARDER FOR HARDER JOBS



X-A-R

ABRASION
RESISTANT
STEELS

HARD ENOUGH AND TOUGH ENOUGH TO LAST

Is abrasion your constant enemy? If your equipment meets materials as they're scooped, shoved, slid, pushed, dragged or dumped, does it face the recurring threat of downtime for repairs or replacement? To eliminate such maintenance headaches, Great Lakes Steel has developed two tougher, harder alloy steels—X-A-R 15 and X-A-R 30. They're supplied in hardnesses from 360 to 400 BHN (or, by agreement, in a range of hardness between 265 and 500 Brinell). And they're especially effective and economical in those critical bear-the-brunt areas of the equipment where wear is worst—liners, teeth, bars, blades and plates, for example. *Under conditions that commonly wear out equipment in a hurry, X-A-R abrasion-resistant steels outwear any other type of steel.*

Great Lakes Steel is a division of



WHERE MATERIALS COLLIDE WITH EQUIPMENT

Chemical composition alone is not the secret of low carbon X-A-R steels; their balanced combination of uniformity, high strength, hardness and toughness is the result of close control during heat-treating, quenching and tempering. This makes them more workable, too. Under normal welding and fabricating conditions use X-A-R 30. For *extremely* difficult problems, such as welding under cold conditions or extensive flame cutting, choose X-A-R 15.

X-A-R abrasion resistant steels are immediately available in $\frac{1}{8}$ " to 1" thicknesses, widths up to 72" and lengths up to 35'. For technical information and supply sources, see next page.



A PRODUCT OF

GREAT LAKES STEEL

Detroit 29, Michigan

NATIONAL STEEL CORPORATION

15 X-A-R 30

TECHNICAL INFORMATION

CHEMICAL COMPOSITION

X-A-R steels are furnished at two specified carbon ranges. These are 14 to 20 carbon for X-A-R 15 and 25 to 30 carbon for X-A-R 30. The balance of the typical composition is:

Manganese.....	.80%	Chromium.....	.65
Phosphorous.....	.020	Molybdenum.....	.20
Sulphur.....	.028	Zirconium.....	.06
Silicon.....	.60		

TYPICAL MECHANICAL PROPERTIES

		At Brinell Hardnesses of:	
		363	400
Tensile Strength, psi.....	180,000		200,000
Yield Strength, psi.....	165,000		180,000
% Elongation in 2".....	17		16
% Reduction in Area.....	56		55
Charpy V Impact at -75°F.....	12 (Ft. Lbs.)		7

*Based on standard .505" specimen

ENGINEERING DATA

Resistance to Atmospheric Corrosion.....	3-5 times copper-bearing or carbon constructional steel
(Rural, Marine, and Industrial Environments)	
Compressive Yield Strength, psi.....	Approx. equal to Tensile Yield Strength
Ultimate Shearing Strength, psi.....	Approx. equal to Tensile Yield Strength
Modulus of Elasticity, psi.....	29/30,000,000
Endurance Limit (rotating beam).....	60% of Tensile Strength
Coefficient of Expansion per °F.....	70°F. to 200°F.—.0000062

FABRICATION

Cold Bend Test: Moderate bending can be performed within the usual range of hardnesses. For free bending, it is recommended that a mandrel be used not less than ten times the thickness of the metal through an angle of 90°.

Welding: Low hydrogen electrodes are recommended for welding X-A-R steels. The grade of electrode used is dependent on the strength requirement of the weldment.

Burning: X-A-R steels can be flame cut without pre-heating or stress relieving after cutting.

COMPLETE METALLURGICAL SERVICE

In addition to the information given in this folder, there is a great deal of detailed data available to steel users covering all characteristics of X-A-R steels. Furthermore, a thoroughly competent metallurgical service organization is available to work with you on any application problem you may have.

X-A-R STEELS ARE AVAILABLE AT THESE STEEL SERVICE CENTERS

BENEDICT-MILLER
Lyndhurst, New Jersey

JOSEPH DEMSEY COMPANY
Cleveland, Ohio

DUCOMMUN METALS & SUPPLY COMPANY
Los Angeles, California

INTERSTATE STEEL COMPANY
Evanston, Illinois

LOCKHART IRON & STEEL COMPANY
Pittsburgh, Pennsylvania

MARSH STEEL & ALUMINUM COMPANY
Kansas City, Missouri

O'NEAL STEEL, INCORPORATED
Birmingham, Alabama

SALT LAKE HARDWARE COMPANY
Salt Lake City, Utah

A. C. LESLIE & COMPANY, LIMITED
Montreal, Canada

15 X-A-R 30
ABRASION RESISTANT STEELS

Rail, Water or Pipe?

The simple act of spotting the location of electric generating plants shows, first of all, that the concentration is in the heavily populated and highly industrialized northern tier of states from the Mississippi River east. A second look shows that a big majority are on or close to water—either the Atlantic or navigable streams, lakes and waterways in the interior. This is natural since people have always tended to locate on water to get, among other things, the benefits of low-cost transportation.

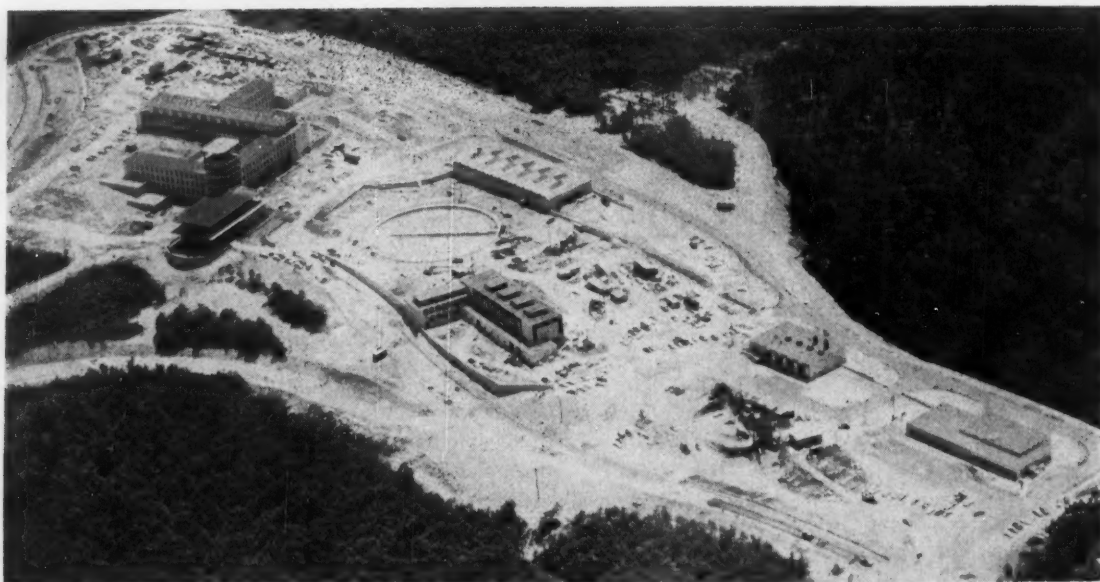
With few exceptions, therefore, interior power stations are being built where the coal can be brought in by water directly from the mine. The alternatives are joint rail-and-water, all-rail, truck and pipeline routes, the latter being the newest contender in the field. What are some of the prospects for the pipeline?

Based on the success of the pioneer Hanna line to Cleveland, several possible routes from mining to major consuming points can be laid out on the map in the Middle West. An even bigger potential, however, is along the Washington-Baltimore-Philadelphia-New Jersey-New York-Connecticut "power-plant belt," where some of the heaviest fuel-burning concentrations in the world exist and where the main transportation medium presently is rail. The big rail-pipeline battle could take place in this area, with a lesser collision in the Middle West. But in any event the last word on rates on this bulk business has not been said.

Fluid Revolution

"We are confident that the threat of widespread fire disasters in coal mines would be considerably reduced if fire-resistant hydraulic fluids were used in the hydraulic systems of underground equipment, and we request that you make a sincere attempt to sell this thought to management representatives at the time of your regular inspections of mines. As a followup measure, and until further notice, the inspector should indicate in general information in each report that he discussed the safety features of fire-resistant hydraulic fluids with management (at those mines where flammable hydraulic fluids are used underground) and include management's reaction."—May 10 memorandum to "All coal-mine inspection personnel," from James Westfield, assistant director health and safety, USBM.

The revolution in underground hydraulic fluids is now on. Fortunately, it is a revolution whose benefits in greater safety and efficient operation will far outweigh any temporary inconvenience or ultimate higher costs—if any—of fluid and equipment. The user already has a choice among several approved fluids, and new ones are being added to the list almost daily. Field experience is now sufficient to permit adoption of the fluids with a minimum of repercussions, and it can be accepted that flammable fluids will be completely out underground within 2 to 3 yr—perhaps even less.



BETHLEHEM STEEL expects to complete "phase one" (above) of multimillion dollar research center this fall. Industry is building new competitive strength by stressing research, market development and production efficiency.

Outlook: Steel and Coal

Steel is still a growth market for coal. Supporting the conviction, check what steelmen are saying about . . .

- What happened in first-half '60.
- Prospects for immediate and long-term growth.
- Competitive problems and solutions.
- Progress in market development.

By W. A. Raleigh Jr.
Associate Editor, Coal Age

THERE IS only one way for long-range demand for steel to go—UP. This is the firm conviction generally shared by steel-industry executives and analysts interviewed by *Coal Age* to reevaluate coal's market strength with its second biggest customer.

In two previous articles (May, 1956, p 54; March, 1959, p 66), this strength was defined substantially as follows:

The coke rate will continue to decline with the ultimate industry average probably reaching 1,200 to 1,300 lb of coke per ton of pig iron by 1975. Last year, it was an estimated 1,500

lb; in 1957, 1,703 lb; in 1948, 1,947 lb.

Offsetting a declining coke rate will be modest growth in steel demand, more use of hot metal in the open hearth, and increased electric power needs for ore-beneficiation programs, electric-furnace operation and stepped-up automation in rolling and finishing mills. Also favorable are opportunities for coal-use in direct-reduction processes.

Direct reduction poses no immediate threat to use of coke in steel-making, witness the continued construction of blast furnaces. Technical and economic developments suggest an evolutionary, rather than a revolutionary change-over. Even this is not a certainty. Most companies are simul-

taneously (1) pursuing greater economies in conventional coke-oven blast-furnace techniques, and (2) conducting continuing studies of direct reduction.

In sum total, allowing for all plus and minus factors, an overall steel market of 165 to 175 million tons of coal and coal-equivalent is foreseen by 1975. Producers will cash in on this potential as long as they continue to adapt themselves to changing carbonizing needs of the steel industry and deliver a low-cost, high-quality product—of course provided the "modest growth in steel demand" actually takes place.

The need for reassessing this latter factor—the key to offsetting a declining coke rate—came into focus this

year when some experienced observers began expressing opinions that steel might no longer be a growth industry. These doubts were precipitated by the sharp drop in the industry's operating rate, despite unanimous predictions of sustained resurgence in demand following the end last November of a 4-mo strike, plus such other developments as continuing high-level imports, stiffening competition from alternative materials, such as, aluminum and plastics, and an accelerated trend toward production of compact cars which use considerably less steel per unit. In the background, also, observers noted a leveling-off in steel demand during the past 5 yr.

Top-ranking steel executives categorically deny there is any real substance to talk that their industry has stopped growing. No one discounts the aggressive inroads which competitive materials and imports are making. And no one expects massive upturns in steel demand or a growth rate comparable to that expected in relatively new industries like aluminum, plastics or electronics.

But, long-range, steady upward movement in steel demand is much in the picture. Supporting this conviction is the following fact-and-opinion roundup highlighting what happened to steel in the first half of 1960, how the industry views immediate and long-term opportunities for expanding steel consumption, and what it is planning and doing to convert these to reality.

Steel Outlook

The Current Year—Any evaluation of future prospects for steel demand must start with some explanation of why the industry's operating rate nose-dived from 93% in early March to 43% in early July. A synthesis of opinion shows the surprise plunge was compounded of many factors, including the following:

1. Excessive buying followed termination of the strike in November, 1959.

2. The industry's return to full operating capacity occurred more quickly than anticipated.

3. Expectations for a husky build-up in inventories did not materialize.

4. The economy failed to live up to year-end forecasts for growth during the first and second quarters.

5. Imports continued to climb to record levels.

6. The impact of all these conditions still existed as the industry entered its normal mid-year slow-buying period.

While each factor played its part, steelmen consider a major changeover in inventory policy—from accumulation to decumulation—was the primary cause. Their reasoning is based on reports from customers revealing that they shied away from inventory build-up because of any one or combination of the following: high money rates, stability of steel prices, assured supply of steel, and growing use of computers which enable more precise inventory control.

Having apparently reached the bottom of inventory decline by September, steel economists now look for a steady month-by-month pickup in the operating rate through December. Pinned down to numerical values, this could mean an average operating rate of 60 to 65% in the third quarter, a 70 to 75% rate in the fourth quarter, and a year-end tally of 110-115 million tons.

Prospects for buildup in the operating rate are quite firmly based. With inventories pared to the bone, orders will have to match consumption which, most analysts contend, has been running ahead of production. Furthermore, demand strength is developing in steel's three largest markets—automotive, construction and machinery.

Orders for auto steel should increase as manufacturers switch over fully to production of 1961 models. These were slated to go on the line earlier this year, starting perhaps by early August.

Steel shipments for heavy construction (bridges, industrial plants, mass housing, highways, dams, etc.), which have not been doing so well, should also improve. Contracts awarded in April, May and June were among the highest in construction history, McGraw-Hill's *Construction Daily* reports. The total dollar volume for the first 26 wk of 1960 was 9% ahead of the comparable figure recorded for 1959.

"The McGraw-Hill Index of New Orders for Machinery" reached a new all-time high of 188 (1950=100) in May," the company's Economics Dept. notes. "This new peak was one point

higher than the previous record high attained in the pre-steel strike month of April, 1959. The index of new orders for machinery rose 8% in May, after averaging around a level of 170 for the previous 4 mo."

1961 and Beyond—In 1961, inventories are expected to continue at a generally low level and thus should not aggravate the production picture. Inventory trends are tricky and unpredictable at best. But most observers agree that reasons previously cited for low inventory policy in 1960 will remain in the picture next year. Possible exception, of course, is a drop in money rates which might follow if a Democratic president takes over.

The level of 1961 output will depend primarily on how the general level of economic activity affects demand in steel's established markets. At the present time, there are no reasons to expect a boom year. In fact, best guessing calls for a dip in steel production to the range of 100-110 million tons.

Steelmen look for production growth to resume in 1962 and, assuming labor peace, to continue unabated through the foreseeable future or through 1964 when an output of about 120 million tons is visualized. In the 1962-65 picture they see major increases in household formations coming up, higher per capita consumption of consumer goods, greater stress on upping the economy's rate of annual growth, and a wider spread between capacity and production, which will strengthen market structure.

Steelmen generally agree that a wider spread between production and capacity will strengthen the market structure for these main reasons:

It will allow selective use of most efficient plants and thus help to keep costs and prices down.

It will generate more aggressive merchandising effort. When operating capacity runs in the high 90s, as it did for most companies through most of the postwar period, orders come in more or less automatically over the transom. Under such conditions, there is little need to fight competitive materials and little incentive to create new demand.

Just what the spread between capacity and production should be is a controversial point. Some say a good, healthy, average annual operating rate would be 80 to 90%, while others

take the more extreme positions of 70 to 90%. Differences on this point are natural as market requirements vary from company to company and from one producing area to another. Attempting to resolve these differences, one seasoned analyst figures a 75% rate will more nearly match the level of future industry-wide demand.

In spite of the trend toward a lower operating rate, no appreciable curbs in expansion of capacity are foreseen. Technological changes and a continuing drive for greater efficiencies in production will bring capacity increases averaging at least two million tons annually. Thus, total capacity, now 150 million tons, should fall between 180 and 190 million tons by 1975.

In the final analysis, steelmen emphasize that long-range growth potentials for steel consumption are essentially based on the growth rate of the economy. During the past 5-yr period, 1955 through 1959, average annual consumption remained fairly steady (in millions of tons: 79, 78, 77, 70, 73, 80). This level of demand prevailed mainly because the economy's growth rate slowed to a snail's pace of 2½%. "Steel, like other basic industries, hasn't been strong in recent years," one steel executive explains, "and won't be until there is a kick in the economy's growth rate."

If this rate is quickened to 4 or 5% in future years, substantial boosts in demand should occur in steel's biggest markets which include automobiles, construction, machinery and containers. Increased demand from these outlets is expected to provide the necessary growth base, offsetting a leveling-off, or possibly some decline in usage by the railroad and oil and gas industries.

Neither the accelerated trend to compact cars nor high-level imports are considered any real threat to steel's growth.

Compact cars use one-third less steel than conventional sizes. But, over the long range, this lower "basis-weight" factor enables a lower-priced product, and, in turn, a widening of the market and an increase in the total volume of steel needed. This has happened before in other major steel-consuming lines, such as, containers. There is no reason why it should not also happen in the automotive field.

The outlook for foreign trade in steel-mill products during the re-

mainder of 1960 is for declining U. S. imports and rising exports, the Commerce Dept. reported in July. Imports for this year were predicted at less than 4,000,000 tons, compared with 4,400,000 tons in strike-year 1959. Exports in 1960, the Dept. said, should exceed 3,000,000 tons. One prominent steel executive sums up the long-range outlook as follows:

"Imports are here to stay and will continue as a competitive factor. Foreign manufacturers have a tremendous advantage in lower labor costs. But, in terms of quality and availability of all lines of steel products, the U. S. is still out in front. Meantime, the opportunities for export are enormous. We can't say when and in what quantities such will be realized. But the upsurge of world needs for industrialization are increasing every year, and foreign producers just don't have the capacity we do."

Growth: Problems And Solutions

Problems—In common with other basic industries, steel recognizes that its potentials for growth are tied fundamentally to the economy's rate of growth. What is still more important, however, the industry realizes that gaining its maximum share of the Nation's growth will not be automatic. The essential need is for continuing, unified effort (1) to combat inroads of competitive materials and (2) to develop new markets.

Both problems are related. In the first of a series of reports on "Competitive Materials, Problems . . . Opportunities," published last March, the American Iron and Steel Institute explores this relationship as follows:

"The problem of competitive materials is usually thought of in these terms: What can steel companies do, individually and as an industry, to prevent competitive materials, such as aluminum, plastics, etc., from capturing substantial markets which historically have been steel's (or which, if the competitive material didn't exist, could be served by steel)?

"The problem is a sizeable one. Inroads have been made by other materials across the complete spectrum of steel's markets. Aluminum is being used in substantial amounts in the automobile in applications that could be steel or cast iron. Prestressed concrete has invaded the construction

market, and what was once thought of as an engineering novelty has become a very real competitor. Tin plate has so far successfully weathered competition from aluminum for cans, but plastics in the form of polyethylene have already captured a portion of the utility can market and give promise of increasing penetration substantially. While the steel industry has worried considerably over the loss of nail markets to foreign producers, an even more serious problem is the loss of these markets to adhesives.

"It is difficult, if not impossible, to put tonnage or dollar figures on these inroads; but it should be clear from these examples that the total impact of competitive materials on steel markets is neither small nor insignificant.

"However, is the growing competition among materials the whole problem, and will merely resisting the inroads of competitive materials bring maximum benefit to the steel industry? Without detracting from the importance of the competitive materials situation, it appears that the growing competition among materials is really just one manifestation of a larger, more fundamental problem: How can the steel industry adjust to and profit from the impact of changing technology on the markets for steel?

"Obviously this [question] encompasses competitive materials. It is changing technology that has brought many of them into existence, and into use. However, changing technology has done other things as well. It has reduced the use of steel in markets where there was no competing material. Prime example: railroads. On the other hand, it has also opened new opportunities for steel. Obvious example: atomic power.

"Stated another way, the basic problem is: What can steel companies do, individually and as an industry, to capture as large a share as possible of the growing markets for materials of all kinds—manufacturing, construction materials, packaging materials?"

Solutions—Toward solving the basic problem, AISI made the following general recommendations to the industry:

1. Seek a realistic growth rate volume base, it should not look for keyed primarily to the demands and potentials of changing technology. Since steel is building on such a high—the same percentage of annual growth

as may occur with newer materials like aluminum and plastics.

2. Strive for a greater awareness of new sales opportunities and grasp them firmly. Steel's participation in the future "will not be a mere growth of existing markets, but will be achieved by the addition of new markets in spite of the loss of old ones."

3. Do all possible to maintain or improve steel's relative cost position with other materials, including intensive research and development to upgrade its technical characteristics.

4. "Become expert in many new facets of selling steel products not only against other brands of steel, but against other materials as well . . . It will be necessary to contact different types of people . . . and to tell them different things. The existing concept of customer service may well have to be revised."

AISI figures its activities can do much to aid the cause through collecting information, sponsoring research and creating favorable public acceptance of steel. But, "in the final analysis, the job of selling steel against other materials inevitably rests on individual companies." Success in winning the future depends much on their willingness to:

"1. Organize to do the job—especially to fix responsibility.

"2. Meet competition from other materials aggressively on an application-by-application and customer-by-customer basis.

"3. Establish and maintain contacts with customers beyond the purchasing agent—with design groups . . . engineering departments, research organizations, styling studios, etc.

"4. Promote widely—building upon AISI patterns and themes.

"5. Emphasize development of new products and applications."

AISI's first report on competitive materials was widely acclaimed by policy-making and sales executives of leading steel companies. Many are using its recommendations as guideposts for thought and action. Most significantly, it is promoting greater

awareness of steel's marketing problems and what to do about them. As one experienced analyst puts it: "This is half the job of developing the imaginative approach essential to achieving maximum company and industry sales potentials."

Market Development: Modernizing for Profit

Whether or not related to AISI's current drive, more and more evidence is popping up—on both industry and company levels—to show that steel is modernizing its approach to selling and market development.

Cited frequently as an outstanding example of effective industry action is the "steelmark" program to popularize steel on the consumer level. The steelmark, originated by U. S. Steel, is a trade symbol consisting of three colored stars enclosed in a circle with the word "steel." Full property rights to the symbol were turned over to AISI which, early this year, launched a campaign to coordinate its use for advertising and product-identification. By March, the institute had printed 13 million tags, stitches and emblems for such purposes, and another printing order was reported imminent.

Among hottest items on the industry's new or improved product list are steel aircraft skins, colored stainless steels for curtain-wall construction in modern office buildings, stainless-steel window frames, plastic-coated steels and lighter-basis tin plate. Consider a few typical examples of individual company interest.

U. S. Steel, National Steel and Pittsburgh Steel are now marketing plastic-coated steels "with a scratch-proof surface that can be embossed with various designs."

Republic Steel is merchandising X-TRU-COAT, "a plastic-coated steel pipe that combines the protection of plastic with the strength of steel."

Bethlehem Steel is pushing BETH-NAMEL, a new sheet steel which gives promise of permitting one coat of enamel instead of the standard two coats. It is designed to compete more effectively with aluminum and plastic counterparts in the appliance and building-contractor markets.

Jones & Laughlin and other companies with stakes in the container business are increasing penetration of the market for "soft drinks in cans." Tin-plate sales for this use were 37%

higher in 1959 than in 1958, and are expected to move up again this year.

New or improved products furthermore, are being backed up by new marketing concepts. In May, for example, J & L announced a new stainless-steel marketing plan aimed at supporting steel-service centers with advertising, promotional and technical services. Similarly, in June, Republic Steel introduced a new stainless-steel sales training program designed "to help Republic distributors and their salesmen become order makers instead of order takers."

New emphasis on research is also in the picture. In the 5 yr ending December, 1959, the eight largest companies invested an estimated \$38 million in new research facilities and housing. This year and next, the same companies will increase the number of research personnel by an estimated 25%.

Especially notable on the research scene, Bethlehem Steel this fall expects to complete "phase one" of a multimillion dollar research center at its headquarters location, Bethlehem, Pa. Last May, U. S. Steel, at its research center, Monroeville, Pa., opened a major new facility—an electromechanical laboratory for applied research in steelmaking processes and product development.

Awareness: Key Spur to Growth

The fact that steel is acutely aware of its problems and aggressively pursuing solutions counts heavily in the book of those who unflinchingly predict its continued long-range growth.

This awareness is finding expression in the industry's more imaginative approach to selling, more vigorous effort to strengthen existing markets, increased expenditures on developing new and improved products, continued emphasis on upgrading production efficiencies, and unchallenged confidence in its product.

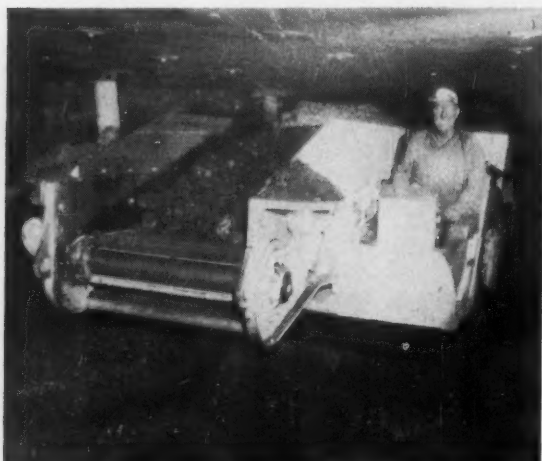
In a growing economy, steelmen recognize there will certainly be a place for all construction and engineering materials. But, they add, "steel is still the most versatile and lowest-cost of those now available. And we'll fight intensively and extensively any efforts to displace steel where it has comparable or better cost and use advantages."



HIGH-CAPACITY LOADER sets the production pace in AC sections. Crews have loaded better than 1,000 tons per shift.



UNIVERSAL CUTTER with 11-ft bar double cuts the coal so that permissible explosives can be used effectively.



TORQUE CONVERTER CAR carries 7-ton payload to discharge station. Two shuttle cars serve the loader.



HYDRAULIC CAR SPOTTER moves mine cars past loading point on track loop. Loading stations are moved every 160 ft.

Modernization With AC Equipment

New AC face equipment enables 8-man section crew to set production record of 1,137 tons per shift in 6-ft seam. Trouble-free operation is added benefit of changeover.

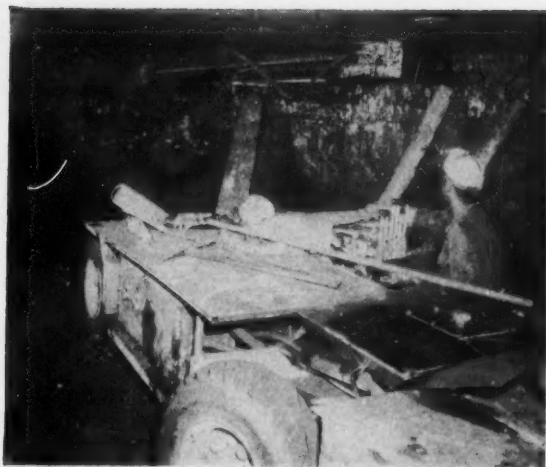
A BIG BOOST in productivity coupled with trouble-free operation are two important gains resulting from a modernization program with AC equipment at the Guyan mines of the Island Creek Coal Co., Amherstdale, W. Va. Today's production record with an 8-man section crew stands

at 1,137 tons of raw coal per shift. And management expects day-to-day section production to range from 900 to 1,000 tons per shift. These new production achievements are double previous output with slower-loading older DC equipment.

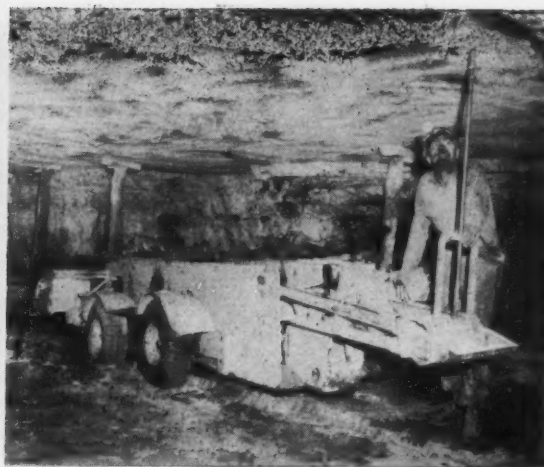
Shortly after acquiring the Guyan

property in Logan County, W. Va., on Feb. 1, 1959, Island Creek management initiated a modernization program designed to increase section productivity. In planning this program, management first tackled the question of whether to use AC or DC face equipment. The company's mining engineers, electrical engineers and operating officials all agreed that the new equipment should be AC powered. They made this decision for several reasons:

1. Near trouble-free operation with several AC continuous miners at No.



ONE-MAN DRILL with long auger bores 2-in holes without changing steel. Auger feed is at front, rotation at rear.



ROOFBOLTER installs 36-in expansion-type bolts on 4-ft centers. One man has set 175 bolts in single shift with unit.



SUPERINTENDENT H. B. Ferguson tests roof bolts with torque wrench.



SECTION CREW travels to working area in its own personnel carrier. Unit is coated with reflective paint for greater visibility.

Doubles Productivity at Guyan Mines

17 mine proved the benefits of AC.

2. The fact that the capacity of the existing DC system was not great enough to supply power for the new equipment, and it would cost too much to revamp the system to bring it up to the capacity demanded by the new units.

Since the Guyan mines were DC operations, management had to choose five areas in the Nos. 1 and 5 mines for initial conversion to AC and then work up a plan to coordinate changes in the electrical system

with deliveries of new equipment. Although the conversion to AC face equipment involved considerable planning, the company was fortunate in having high-voltage power cables already installed underground to carry power to DC substations. Consequently, to convert face operations to AC the problem became one of making minor changes to existing AC facilities and then extending the system to the sections.

Some of the modifications included:

1. Changing the supply transform-

ers at the top of boreholes to convert the mine power system from delta to Y to obtain neutral point for grounding.

2. Adding circuit breakers at the top of boreholes to replace fuses.

3. Installing ground-current limiting resistors to reduce fault current that would appear in the ground wire.

4. Extending the AC system and protective devices to the section.

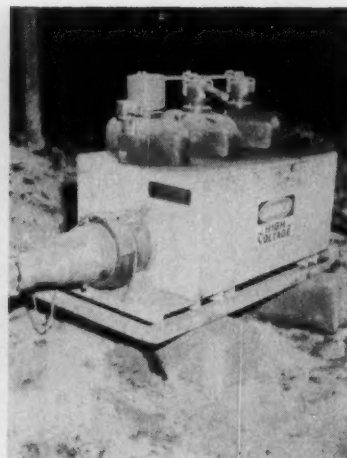
Island Creek's Guyan mines are



FAULT DETECTOR helps mine electrician to find fault in cables faster.



HIGH-VOLTAGE power cable is suspended from roof on insulated hangers.



OIL CUTOUT is provided for each AC section. Unit has key for cable couplers.

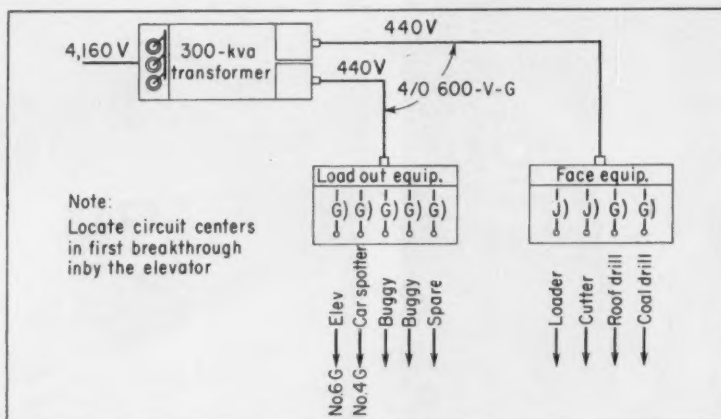
served by the Appalachian Power Co. which delivers 13.2-kv power to a point over the Cross Country Mains in No. 1 mine. From there a poleline system radiates to boreholes leading to mine entries. At each borehole a step-down transformer reduces the voltage to 4,160 for transmission to the underground substations. The company has four 1,500-kva and one 1,000-kva surface transformers for this service. A 4/0 4-conductor armored cable connects the surface substations to the underground transmission system.

In the main mine circuit 1/0 cable extends from the boreholes along the main entries. In secondary entries or room panels No. 2 cable carries the 4,160-V power. All cables are suspended from the roof on insulated hooks.

Each AC mining section has an Ensign three-phase oil cutout installed near the mouth of the panel. This cutout has high-voltage couplers that fit those on the main power cable and thus can be easily added or removed from the circuit.

After leaving the oil cutout the No. 2 cable continues to an Ensign skid-mounted 300-kva transformer which reduces voltage to 440 for operating face equipment. Sections of Anaconda No. 2 cable are made up in 500-ft lengths with a PLM socket on one end and a PLM plug on the other. Four of these sections and one length of flexible SHD portable cable are supplied for each mine section.

The section of SHD cable always is kept next to the section transformer.



AC POWER setup for conventional AC section includes 300-kva transformer with two low-voltage circuit breakers, one for loading and one for haulage equipment.

As the coal faces advance 500-ft sections of the standard No. 2 cable are added and the transformer pulled ahead.

On the low-voltage side of the transformer are two outlets which provide power for two Ensign safety circuit centers. One safety circuit center serves the cutter, loader, roof drill and coal drill. The other supplies two shuttle cars, elevator and car spotter. All face machines have 400 ft of Type G 3-conductor trailing cable. Company standards require that the section transformer be moved ahead as soon as any face equipment is 600 ft away from it.

Safety circuit units have instantaneous ground-trip devices on the breakers and the section transformer has time-delay ground trips on its breakers. The electrical setup is de-

signed to provide selective tripping on any fault. These circuit centers are located at the first breakthrough inby the loading point.

To eliminate accidents which might result from uncoupling live cables, the high-voltage system has built-in protection. All high-voltage couplers are locked and to get the key to unlock them the high-voltage cutout must be opened. Once the key is used to unlock a coupler it cannot be removed from the coupler lock until the cable is reconnected. The oil cutout itself cannot be reclosed until the key is returned to its place on the unit.

Mining Today

New AC equipment in each section includes a Jeffrey 81AH loader, Jeffrey



SKID-MOUNTED transformer steps 4,160-V power down to 440 for operating the AC face equipment.



TWO safety circuit centers provide protection for AC equipment. One serves loading equipment, the other haulage units.

70 URD cutter with 11-ft bar, Galis rotary roof bolter, two National Mine Service Torkars, Long self-propelled coal drill, Long elevator and Stamler hydraulic car spotter. An 8-man crew supervised by a foreman uses this equipment to produce 900 to 1,000 tons of raw coal per shift from the Cedar Grove, or Island Creek, seam. Each crew travels to the section in its own Lee-Norse Portabus. These carriers are coated with Codit reflective paint and have Femco trolleyphones.

Coal thickness varies but averages 6 ft. Roof and floor conditions are good and contribute to easy maneuvering of face equipment. Life expectancy is over 30 yr at present production rates in the Guyan mines.

Mining Methods

Main entries are developed with six headings 18 ft wide on 60-ft centers. Breakthroughs are spaced 80 ft apart and cut 90 deg with the headings. Track is laid in Nos. 3 and 5 headings and shuttle cars discharge in No. 4 to mine cars traveling in a loop system.

Panel entries are developed with five entries 18 ft wide on 70-ft centers. Breakthroughs also are cut on 70-ft centers and at right angles to headings. As the entry advances track is laid in the Nos. 2 and 4 headings. Shuttle cars discharge coal into elevators in the No. 3 for delivery to mine cars.

Coal now is double cut at the bottom but as machine operators become more familiar with the universal cut-

ters the cutting may be altered to include shearing or top cutting. The Long self-propelled coal drill uses a 1 $\frac{7}{8}$ -in Cardox auger fitted with a 2-in bit. Operated by one man and capable of drilling a hole without changing augers, the unit bores six holes per cut in an 18-ft place. Three holes are spotted near the top of the seam and three near the undercut. Each is charged with five sticks of du Pont 1 $\frac{1}{2}$ x8 permissible powder.

Management reports that a cut of coal measuring 5 $\frac{1}{2}$ x20x10 ft has been loaded in 13 min. Each shuttle car carries a 7-ton payload to the discharge station where a Long elevating unit transfers it to mine cars. Mine cars, handled by a Stamler hydraulic car spotter, move by the loading point in a loop system.

To keep shuttle-car haulage and power transmission distances to a minimum, new loops and loading points are set up every 160 ft. Switches and track are left in place in panels as headings advance so that no track work will be needed on retreat.

Mining plans call for room entries to be driven 1,800 to 2,000 ft deep with room and pillar mining off one side on retreat. Rooms on 40-ft centers will be driven 180 ft deep in groups of four and pillars will be recovered on an angled line.

As soon as the loader leaves a working place the roofbolter moves in and installs 3-ft West Virginia bolts on 4-ft centers. Bolt holes are drilled with Carmet bits. One man has set as many as 175 bolts in one shift with

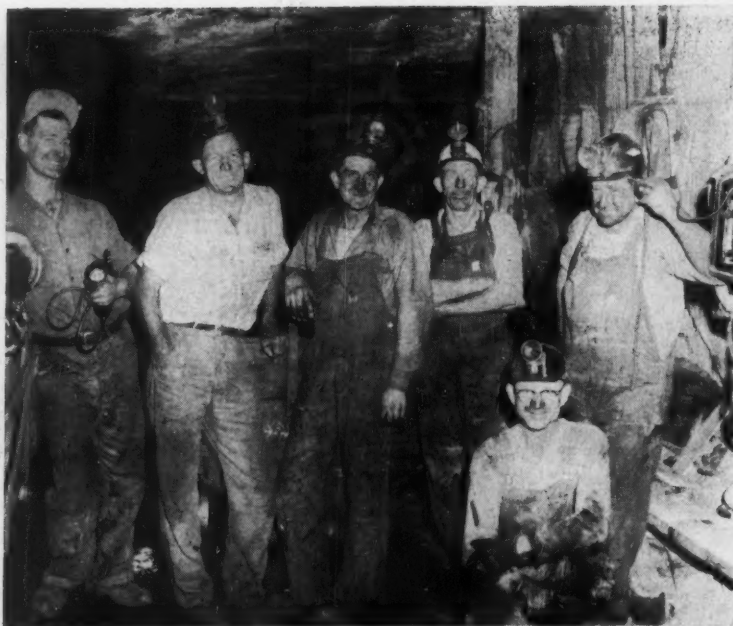
the Galis roofbolter. Additional roof support in main headings is provided by a single row of straight props along each side of the opening.

Mine cars are handled at the loading points in a string of 15 to 30 cars by the hydraulic car spotter. A 13-ton Jeffrey locomotive, shuttling between the loading point and the main haulage, pulls a trip of 20 to 30 cars. On the main haulage a 15-ton General Electric locomotive, aided by a 13-ton pusher unit, moves 50-car trips 4 to 5 mi to the preparation plant.

Maintenance Training

As Island Creek's modernization program moves forward at its Guyan mines a maintenance training program is being set up for the new equipment. This training will be coordinated with shop overhauls and will combine AC theory with shop experience. The company is now setting up the special classes in AC theory. A third step in the AC modernization program will be to provide spare machines so that any face unit can be taken out of service for major repairs.

Today's maintenance program includes underground troubleshooters on both production shifts. These men report to an underground shop where they work on various repair jobs under the supervision of the master mechanic. If trouble occurs on a section one or more of the mechanics can travel to the trouble in a few minutes. All major repairs and greasing are done on the third shift to keep on-shift delays to a minimum.



MEN AND MULES provide the mining and haulage power at Kuhn Cooperative, which epitomizes the mining practices of the olden days. The working force includes, at the left, Walter Boczek, Leonard Kreger, John Kreger, Ed Mydler, Sylvester Felts and Ervin Heck. At the right is Jennie, one of the six mules providing motive power.

Oldest in Illinois . . .

Kuhn Cooperative Shows How They Used to Do It

By Grover Brinkman,
Okawville, Ill.



NEARING THE CENTURY MARK IN AGE, Kuhn Cooperative nestles alongside the tracks of the Illinois Central, whose high iron carried the immortal Casey Jones a little over half a century ago. Steam operates the hoist.

DUBOIS, ILL.—At this Polish community in the southern Illinois coal belt, it is possible, simply by dropping 300 ft, to turn the clock back a century. You do this by stepping on the cage and letting yourself be lowered to the No. 6 coal vein mined by the Du Bois Coal Co. The mine, known locally as the Kuhn Cooperative, is the oldest active coal mine in Illinois. It was operating when General Grant took Richmond, and it is now in its 94th season.

That is only part of its unusual history. The mine today is operated almost exactly as it was when the shaft was dug. Just a pick-and-shovel mine, with mules pulling the cars, and miners working with open-flame carbide lamps. The hats, however, are a modern touch. They are hard. And there are a few electric lights and a telephone at the bottom. But at the face mining is with pick and shovel.

The top is solid rock and the mine is classified as nongassy. "It's one of the safest mines in the world," the guide, John Waligorsky, says. "We planned to modernize this mine at one

This bond goes on quick and won't shake loose



USS Tigerweld Wedge-Type Bond.

Easy to install and low in cost.

Drill two holes, insert the terminals, hammer in the wedge—your USS Tigerweld Wedge-Type Bond is installed. It's designed for temporary use in mines, but it holds so well that it is often used for permanent track.

The bond has copper terminals to assure low resistance and drop-forged steel wedges that can take the pounding and be used over and over. Mechanically, the wedge-type bond is strong enough to withstand heavy vibration and derailments . . . it won't shake loose.

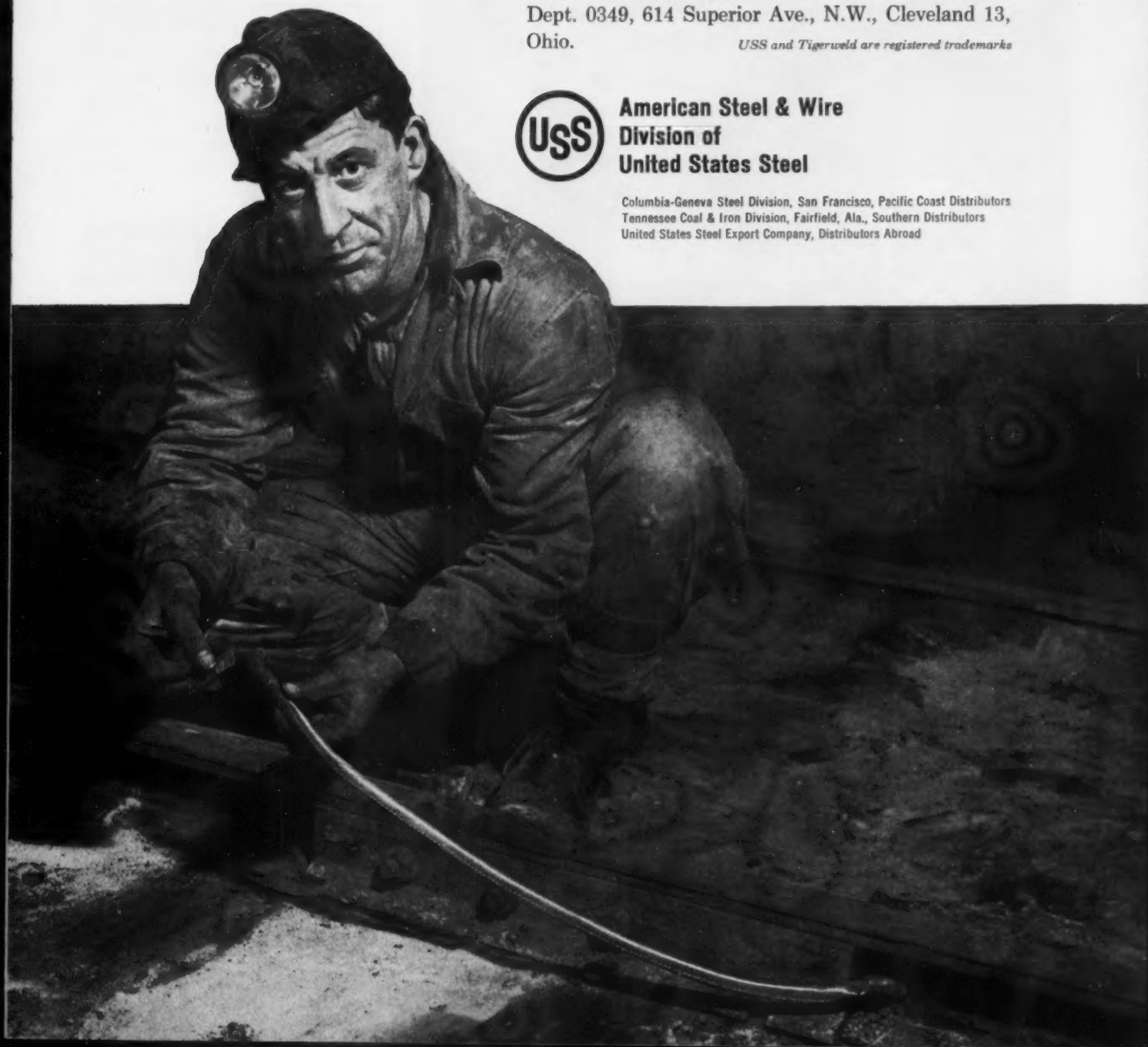
For complete information write for our free booklet "Tigerweld Power Bonds," American Steel & Wire, Dept. 0349, 614 Superior Ave., N.W., Cleveland 13, Ohio.

USS and Tigerweld are registered trademarks

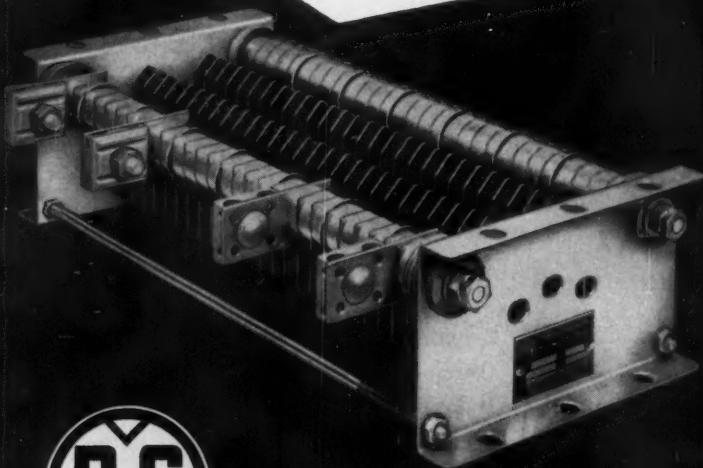


**American Steel & Wire
Division of
United States Steel**

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, Distributors Abroad



There is a difference in Resistors



Resistors have proved
this for many years

Different, because steel and mica, both extremely durable materials, coupled with P-G exclusive design produce a resistor of great mechanical strength. There is nothing to break. With accurate resistance values and adequate carrying capacities, P-G Resistors outlast ordinary resistors. Tell us your specifications and let P-G solve your resistor problem.

For any job . . . Where constant "trouble free" resistor service is wanted . . . you can safely specify P-G Steel Grid Resistors and get better performance with low cost maintenance.

The Nonbreakable Steel Grid Resistor



THE POST-GLOVER ELECTRIC COMPANY

OFFICE and FACTORY—Kenton Lands Road, Erlanger, Kentucky

MAILING ADDRESS—Box 709, Covington, Kentucky

time," Waligorsky continued, "but now I'm glad we did not. It might have ruined us. It would have placed us in an entirely different bracket of operation. This way, operating as a co-operative, we can keep open, and give 20 or more local men work."

The mine shaft was started just prior to 1865. Adjacent to the tippie, the trains of the mighty Illinois Central thunder by. The little mine has witnessed the passing of the old balloon-stack locomotives, the iron horses of the Civil War era. Its first coal fired some of the famous Hayes ten-wheelers. Casey Jones, now a railroad immortal, steamed by the little mine on the Illinois Central's high iron. Now the railroad's coal-burners are shelved, and sleek diesels roar past the old tippie.

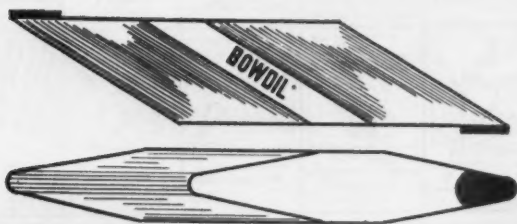
The narrow mine shaft is exactly 300 ft deep. Water from a spring some 20 ft below the surface has soaked its black walls for nearly a century. In the headings time has stood still. Mining is room-and-pillar and, although the diggings now are a mile from shafthead, there still is enough coal for another century or two.

The operation is strictly cooperative. Each ton of coal brought up pays the owners a royalty percentage. This season the mine is producing slightly better than 100 tons daily, working 24 men underground and 5 more topside. A large part of its coal goes to Chicago via rail, although it enjoys a brisk local truck trade as well.

"The mine inspectors are always telling us to shut it down—that we can't hope to compete with big, modern mines," Waligorsky continued. "But we just grin and tell them we'll think it over."

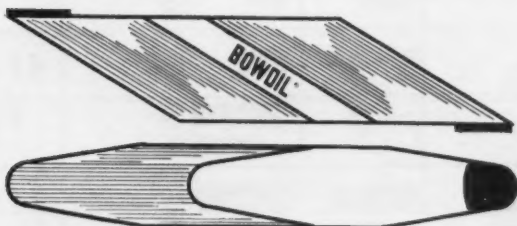
Of course the farmer-miners don't intend closing. In the summertime, they work their nearby farms. Then, about September, when the crops are in, they turn miner. The mules are brought in from pasture and "maneuvered" into the cage. The shaft itself is so narrow that to get a full-grown mule down it, he is put in a "sitting" position, whether he likes it or not. Usually four mules work, while two more rest in the "barn" below ground.

The operation of this little mine defies all modern day technocracy. It really is a triumph of muscle over machine, for the mine has paid a consistent profit to its owners, year after year.



No. 1-19

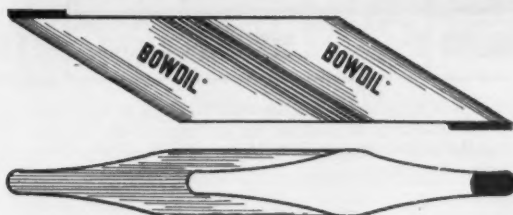
Regular Diamond Bit BOROD TIPPED. Designed for medium cutting conditions, they save power, produce coarse cuttings.



No. 1-20

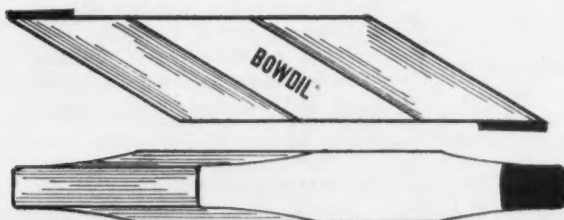
Heavy Diamond Bit BOROD TIPPED. Designed for severe cutting conditions, such as iron pyrites and rock.

TO HELP YOU RE-ORDER, PLACE YOUR TYPE BIT ON THESE ACTUAL SIZE DRAWINGS



No. 1-28

Regular Concave Bit BOROD TIPPED. Designed for maximum power savings. Concave shape automatically maintains side clearance. (Patented feature.)



No. 1-29N4

Heavy Duty Concave Bit BOROD TIPPED. Designed for very severest service.

introducing...

BOROD TIPPED BOWDIL BITS

4 MOST POPULAR STYLES

These various types are designed for specific requirements. After the BOROD is placed on the Special Alloy Steel body it is heat-treated to the most serviceable temper.

We are happy to offer these quality bits for your individual needs and cutting conditions.

**ORDER BY
NUMBER**



THE BOWDIL COMPANY • CANTON 7, OHIO

Gentlemen: Rush us









(Quantity) NO. _____ BITS

Name _____
(PLEASE PRINT)

Address _____

City _____ State _____

The **BOWDIL** COMPANY
CANTON 1, OHIO
Just phone
Glendale 6-7176

RESISTANCE TO SCRATCH ABRASION SAND, GRAVEL, STONE, ETC.	TOUGHNESS OR RESISTANCE TO IMPACT WITHOUT CRACKING OR SPALLING	RESISTANCE TO DEFORMATION HARDNESS	MACHINABILITY	RESISTANCE TO CORROSION RUST, PITTING, HIGH TEMPERATURE SCALING	DEPOSIT THICKNESS	COST	ELECTRODE SIZE AVAILABLE
 NUMBERS GIVE TIMES MORE ABRASION RESISTANT THAN MILD STEEL. BAR WIDTH SHOWS RANGE.	 POSITION OF BAR SHOWS RELATIVE RANGE OF IMPACT RESISTANCE	 POSITION OF BAR SHOWS RANGE OF ROCKWELL HARDNESS	 LENGTH OF BAR SHOWS RELATIVE DEGREE OF MACHINABILITY	 LENGTH OF BAR SHOWS RELATIVE DEGREE OF CORROSION RESISTANCE	 BAR SHOWS THICKNESSES OBTAINABLE WITHOUT SPECIAL PROCEDURES	 \$1 52 63 64 85	 ELECTRODE DIAMETERS AVAILABLE IN INCHES
1 2 3 5 10 25 50 100 LOW HIGH	LIGHT IMPACT MULLER TIRES MEDIUM IMPACT CRUSHER HAMMERS HEAVY IMPACT BLOCK-BUSTERS LOW HIGH	(C) (C) (C) WORK HARDENED WORK HARDENED WORK HARDENED HEAT TREATED HEAT TREATED HEAT TREATED HEAT TREATED WORK HARDENED HEAT TREATED C-1040 STEEL	GRIND MACHINE ANNEALED ANNEALED ANNEALED ANNEALED ANNEALED ANNEALED ANNEALED ANNEALED ANNEALED	REIN. MAX. 1/8 1/4 1/2 3/4 1 1 1/2 2 3 4 5 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 100	5/16 IN. DEPOSIT 5/16 ELECTRODE M3 C		

POSITION OF BARS in each column indicates how good the electrode is in that particular characteristic. Numbers in the right-hand column refer to types of electrodes discussed in the text under electrode selection. In general, the farther the bar is positioned to the right, the better the electrode. The width of the bar indicates the degree to which welding procedures effect the deposit. The wider the bar the greater the effect.

Hardsurfacing Guide

This guide covers metallurgy of hardsurfacing, how to analyze each job, and the proper selection and application of electrodes. It is designed to aid the experienced users of hardsurfacing materials as well as beginners.

By V. Peters
Development Engineer
The Lincoln Electric Co.
Cleveland, Ohio

HARDSURFACING is a low-cost means of extending the life of equip-

ment. It not only reduces the cost of replacement parts but also keeps equipment operating more efficiently and cuts downtime, thus increasing output.

Manual hardsurfacing is versatile and inexpensive. It involves putting

a thin layer of wear-resistant material on wearing parts by the metallic arc-welding process. Investment in equipment and materials for this set-up is small. It can be used on a variety of applications with little change.

However, several factors must be weighed carefully before deciding to use hardsurfacing to improve equipment and efficiency. These factors are:

Cost—Equipment, materials, labor and overhead required to do the job.

Benefits—Increased life of the part, reduced maintenance, improved operation and increased production.

Cost Vs. Quality—On some applications, expensive materials and procedures produce deposits which wear

Electrode Types And Application

1A, Chrome-carbide Powder—Consists of microscopic chromium carbide crystals held in a fairly hard matrix. The carbide crystals and matrix material have abrasion resistance and low impact strength.

1B, Carbide—Weld deposit consists of microscopic chromium carbide crystals held in a fairly hard matrix. The carbide crystals and the matrix material have high abrasion resistance.

1C, Carbide—Weld deposit consists of microscopic chromium carbide crystals held in a tough hard matrix. This material has good abrasion resistance and moderately good toughness.

2A, Semaustenitic—High carbon chromium alloy material. Deposit has high hardness, good abrasion resistance, moderate toughness and excellent hot forging properties.

3A, 3B, Austenitic—Deposit is 11 to 14% manganese steel which is extremely tough and which develops maximum surface hardness by any form of cold working. It is the ultimate in toughness.

3C, Austenitic—Chrome-nickel alloys from 18% chrome-8% nickel to 25% chrome-20% nickel. The deposit has relatively low abrasion resistance as welded but stainless steels will work harden.

4A, Martensitic—High speed molybdenum tool steel deposits are usually satisfactory as welded. Deposit may be tempered or given standard high speed treatment.

4B, Martensitic—A 5% chrome tool steel. This type is versatile since it has good properties as welded and can be improved by heat treatment. Well suited for most tool and die work.

5A, Martensitic—Low-carbon chrome-manganese alloy partly martensitic and ferritic in the as welded condition. The deposit is uniformly hard, moderately tough and will resist friction.

5B, Martensitic—Medium-carbon chromium-manganese alloy. Carbon content usually runs between 0.16 to 0.20%. It may be heat treated and hot forged. Annealing will permit good machinability.

Ferritic Type—Conventional low-carbon ferritic weld deposits having no particular application in the hard surfacing field except possibly for the purpose of preliminary build up.

only slightly better than less expensive materials. On other applications it is necessary to go to more-expensive procedures, such as, preheat or less wear-resistant materials to be sure that the part will not fail in service. Experience, plus a thorough knowledge of application and hard-surfacing materials, is required to properly evaluate these factors.

Materials and Applications

All hardsurfacing deposits resist some form of wear. Some types resist abrasion—the most common form of wear—while others withstand severe pounding which causes the more highly abrasion-resistant materials to fail. Another group of hardsurfacing materials resists corrosion caused by chemicals or high-temperature oxidation. Whatever the problem, there is

a deposit or hardsurfacing material that will stand up under wear to increase the life of parts.

The basic steps in applying hard-surfacing material include:

1. Investigating the job.
2. Selecting the proper material.
3. Depositing the material correctly.

A thorough investigation to determine what the part is, the function of hardsurfacing and the type of wear existing, will greatly simplify executing the last two steps.

Basically, hardsurfacing is easy but it does require additional knowledge beyond that needed for routine maintenance and production welding. Hardsurfacing materials are different from mild steels. They react quite differently to the heating and cooling cycles normally encountered.

Consequently, additional knowledge

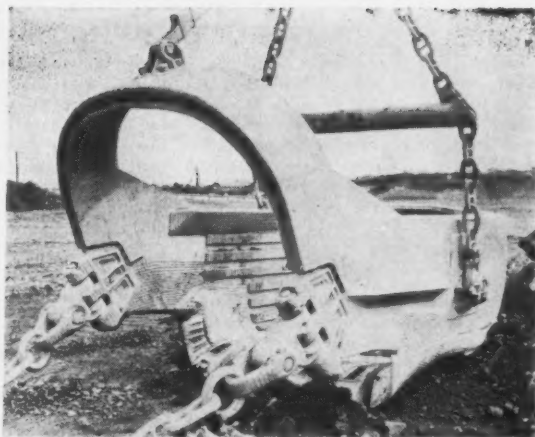
on how hardsurfacing materials react, depending on their alloy content, is necessary. It is most helpful in selecting and applying hardsurfacing materials.

Analyzing the Job

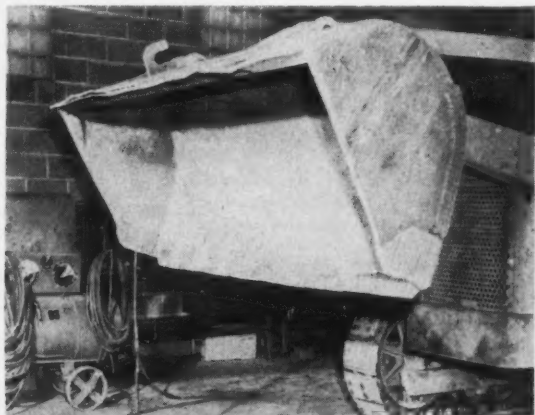
A THOROUGH STUDY of the job greatly simplifies the selection and application of hardsurfacing materials. The following are factors which should be considered.

Shape and Dimensions

Size and Shape of Parts—These factors have a very great effect on the cooling rate of the welding deposit. If the mass is large the part will cool quickly; if small the cooling rate may be very slow. As cooling rate affects the hardness of some de-



DRAGLINE BUCKET must withstand both abrasion and impact. Proper use of materials is important.



BUCKET OF THIS LOADER wears rapidly when not hardsurfaced. Hardsurfacing lasts up to 15 to 20 times longer.

Metallurgy of Hardsurfacing

STEEL is basically an iron containing carbon and other alloys. Mild steels—0.10% to 0.30% carbon—used in normal fabrication contain, in addition to carbon, small amounts of manganese, sulphur, phosphorus and silicon. These elements, generally, total less than 1½% of the materials in steel, the remainder being iron.

Types of Steel

In alloy steels, up to 50% of the materials may be alloys, such as, nickel, chromium, molybdenum, vanadium and tungsten. These alloys change the properties of steel so that they better meet the special requirements of specific applications. Generally, these alloys improve:

1. Mechanical properties of steel through control of the factors which influence hardenability.

2. Mechanical properties of steel at elevated or exceptionally low temperatures.

3. Resistance to chemical attack and elevated temperature oxidation.

From the preceding, it is apparent that hardsurfacing deposits which require exceptional properties must be alloy steels.

Effect of Alloys

Carbon influences the properties of steel in a somewhat different way than alloys. It is the most effective element for increasing tensile strength, hardness and abrasion resistance. However, it decreases ductility and ability to absorb impact, and increases brittleness and cracking tendencies of the material. Consequently, it is difficult, if not impossible, to obtain the desired abrasion resistance and hardness of high-carbon steel and at the same time maintain sufficient ductility to withstand the impact loads common in most hardsurfacing applications.

Alloys control the manner in which the carbon occurs in the deposit at any given cooling rate. In other words, they determine the grain structure, and in so doing control the hardenability and wear resistance of the material.

It is possible to obtain with the same cooling rate a material which has wear resistance comparable to that of a higher-carbon material but which also retains considerable toughness and ductility by substituting other properly selected elements for some of the carbon. This is the reason why most hardsurfacing deposits contain alloys.

Effect of Cooling Rate

For a given alloy content, the cooling rate—above approximately 1600

F—determines the grain structure of the material and controls its properties.

In welding, the weld metal cools from the molten state to room temperature. This is a fairly fast cooling rate. Normally, it has little effect on low-carbon steel deposits but it frequently has considerable influence on the properties of hardsurfacing deposits.

The results of fast cooling can be both beneficial and detrimental in hardsurfacing, depending on the alloy content of the base metal and the deposited metal. Fast cooling, in many cases, produces a more abrasion-resistant deposit than slow cooling.

On the other hand, cooling that is too fast may produce a brittle heat-affected zone in a high-carbon or alloy-steel base metal. This creates a tendency for the deposit to spall. Consequently, as the alloy content of the base metal increases it becomes more necessary to control the rate of cooling.

Types of Structures

As previously noted, the alloy content and cooling rate influence the type of grain structure obtained in weld deposits. The types of structures most common in hardsurfacing deposits are as follows:

Martensitic—Martensite is a type of grain structure that is hard with relatively good abrasion resistance but has comparatively little ductility. It forms only when the percentage of carbon and alloys is sufficiently high and when the cooling rate from above the critical temperature (1600 F) is sufficiently fast. The deposit is magnetic. It transforms to a soft ductile machineable deposit by controlled cooling in a furnace from above the critical temperature and returns to its hard structure when reheated and rapidly cooled from above the critical temperature.

Weld metal deposits which behave in this manner include those with medium-carbon content—0.40% to 0.50% carbon—or with less carbon but with small amounts of other alloys. The cooling rate influences hardness and abrasion resistance. Hardness is a measure of abrasion resistance.

Austenitic and Semiaustenitic—These deposits behave quite differently from the martensitic deposits. They are non-magnetic and comparatively soft and tough. They have the property of hardening at the surface when deformation takes place as in pounding or cold working while the rest of the material under the surface remains soft and tough. If a certain alloy content is sufficiently

high, austenite forms regardless of the cooling rate.

The degree to which an austenitic material work-hardens depends on the carbon content. High-carbon austenite, like that in high-manganese steels (11% to 14%), work-hardens readily and has good abrasion resistance. Low-carbon austenite, like that in stainless steels, work-hardens less readily and has less abrasion resistance. Both have maximum impact resistance. Hardness is not an indication of the abrasion resistance of austenitic deposits.

Semiaustenitic materials are composed of both austenite and martensite. As the amount of martensite in a semiaustenitic material increases, the properties approach those of a purely martensitic material.

Semiaustenitic materials have very good abrasion resistance because austenite is unstable and the surface transforms readily to martensite with a small amount of cold working. Since this martensite has a higher carbon content than low-carbon martensite, it has correspondingly higher hardness and abrasion resistance.

The abrasion resistance of semiaustenitic materials is affected only slightly by the cooling rate. However, the hardness may be greatly affected. Slower cooling rates produce higher hardnesses because more austenite transforms to martensite during cooling. This simply hastens the transformation that would normally occur with cold working. It does not improve the abrasion resistance of the deposit. For this reason hardness is not an indication of the abrasion resistance of semiaustenitic materials.

High Carbon, Chromium Carbide—Materials that contain greater amounts of carbon and certain alloys produce a carbide deposit that has excellent abrasion resistance but only fair impact resistance. When the alloy is principally chromium in combination with high carbon a chromium carbide results. These carbides held in an austenitic or martensitic matrix are inherently hard and respond little or not at all to heat treatment.

While it is necessary to maintain a certain amount of carbon and alloys in the deposit to obtain high abrasion carbides, the cooling rate has little effect on properties. Hardness values are a means of comparing the abrasion resistance of several carbide deposits. However, they may be misleading if used to compare carbide deposits with other types of deposits.

posits, it is possible on some large parts to produce very brittle deposits and on small parts to produce softer deposits. It is frequently necessary to adjust procedures to the size of the part to obtain the desired cooling rate.

Size and Location of Area Surfaced—In a few special cases, this will

influence electrode selection. For example, a very small area requires low current, hence a small electrode can be used. Electrodes also operate best in the flat or downhand position. If there are welds to be made in several planes it is best to position the work to accommodate the downhand operation.

Thickness of Weld Deposits—Thickness of weld deposits will influence electrode selection and welding procedures. If a thick deposit is required it is generally best to build up all but the last two layers with a tough material. The last two layers can then be put on with a hardsurfacing electrode that produces a deposit of the

desired wear resistant characteristics.

Finish Requirements

Many hardsurfacing deposits are satisfactory with the finish normally obtained from welding. However, there are some applications that necessitate a smoother finish. It then becomes a matter of economics to evaluate the cost of finishing the deposits as compared with the wear resistance which they will provide.

Mild-steel, nonferrous and stainless-steel deposits can be machined in the as-welded condition. Lower-alloy martensitic deposits can also be machined if the proper welding procedures are followed.

Any of the martensitic or semi-austenitic deposits can be machined by annealing-heating above the critical temperature and cooling slowly—the deposit to a soft state. These deposits can then be rehardened through heat treatment. The chrome-carbide deposits must be ground to shape if finishing is required. Grinding also can be used on other deposits.

Functions of Hardsurfacing

The functions of hardsurfaced parts in service also influences the selection of the material. Consider the following three functions:

One Surface Protected—A single surface protected from wear by another material is the function of hardsurfacing in the largest number of applications. It includes all earth-moving equipment where wear is caused by materials handled. It also includes other applications, such as, water-turbine blades, where corrosion is a problem. Electrode selection depends principally on the types of wear which, will be discussed later in this feature.

Two Surfaces Protected—Applications where hardsurfacing is to protect two metal surfaces in contact with each other include a variety of parts ranging from lubricated machine parts to such severe applications as the tracks and rollers on bulldozers. The straight martensitic electrodes are especially good for this type of wear when there is little complication from foreign particles, such as, dirt, grit or other wear-inducing materials. When these particles are introduced it is best to go to a more abrasion-

resistant deposit such as the semi-austenitic type.

Cutting Edge Maintained—Shear blades, punches and metal-cutting tools must not only stay sharp but must also hold their original size and shape to operate satisfactorily. This requires special properties of edge strength found in high-alloy martensitic deposits. This is a specialized application and electrodes are designed especially for it.

On many applications, such as rotary drilling, bits and scrapers, wear of cutting edges does not impair operation of the parts. The material may wear as long as it maintains a reasonably sharp edge. This application requires that the deposit have good abrasion resistance. Chrome carbide and semiaustenitic-type deposits are used.

Type of Wear

Wear encountered by the part in service is particularly important in helping select the electrode that will do the best job. Each electrode is designed to resist a different type or degree of wear. In studying the job look for the following types of wear:

Abrasion—Abrasion is the most common type of wear encountered. It may be due to: (1) grinding action due to rubbing against an abrasive material, such as, gravel, sand, clay or soil or (2) sliding, rolling or rubbing action of one metal part against another.

These actions may take place under low or high pressure. It is not uncommon for metal-to-metal wear to be intensified by the introduction of abrasive particles which add a grinding action to the already existing sliding action.

Impact—Impact wear results from repeated pounding by hard rock-like materials. It may vary in degree from light to very heavy. Impact tends to deform the surface or cause cracking, or chipping.

Corrosion—Corrosion results from the action of various chemicals on the material, oxidation or scaling at elevated temperatures. Even ordinary water may cause many materials to rust away.

In most applications more than one of the preceding factors are at work simultaneously. It, therefore, is necessary to evaluate the relative im-

portance of each. The final selection of the hardsurfacing material frequently becomes a compromise because electrodes which have maximum abrasion resistance have minimum impact resistance. Consequently, it is necessary to choose the material which has maximum abrasion resistance and also has enough impact resistance to withstand pounding.

Composition of Parts

Composition, in some cases, influences the electrode selection but much more frequently it affects the procedure used to deposit the electrode. This is true because during welding the part undergoes a heating and cooling cycle which influences the properties of the base metal. More specifically, it affects the properties in the heat-affected zone of the base metal immediately adjacent to the deposited metal. If the base metal is mild steel, the heating and cooling cycle has little effect on its properties. However, if the base metal is a highly hardenable material its properties will be greatly affected, usually causing the formation of an area of hard brittle material, unless proper procedures are followed. Base metals, therefore, are divided into two groups:

GROUP A—Metals and alloys with physical characteristics that will not change very much due to heating and cooling, and will withstand sudden localized temperature changes without cracking, are placed in the group. It includes plain carbon steel with 30-carbon maximum, low-carbon low-alloy steels, austenitic steels, such as chrome-nickel stainless, and high-manganese steels. Copper and most of its alloys also would be included.

These materials give little concern unless the part to be welded has an exceptionally large mass. There is little requirement for any precautions beyond having it at a normal room temperature of 75 to 100 F.

GROUP B—Metals with physical characteristics that will change considerably, particularly as to hardness, caused by welding heat and subsequent cooling, and which will crack with sudden application of localized heat, are placed in this group. It includes medium- to high-carbon steels, tool steels, medium- to high-

Maintenance Ideas



HARDSURFACING deposited where wear is most severe adds life to links.



REPOINTING TEETH is a full-time job at many large operations. Impact-resistant material containing 11% to 14% manganese steel makes sound joints.

carbon low alloys, cast irons (gray, white, malleable, chilled), semisteel and, in general, all hard metals and alloys. It should be pointed out that even mild-steel parts which have been previously hardsurfaced and contain some of the hardsurfacing material fall into this category.

The mechanics of how to weld this type of steel are described in the section on preheat and slow cool. It is important to be able to recognize steels of this type and be aware of what can happen if incorrect welding procedures are used.

Some steels are so hard and have so many internal stresses present before welding begins that the thermal shock of the arc could cause cracking in the base metal as soon as the arc was struck if proper precautions were not taken. The crack may be small or it may progress through the entire part. Look for this type of material in large cast parts known to be made of high-alloy materials.

In other materials the condition may not be so severe, yet they contain enough alloy to cause the heating and cooling cycle to produce a very hard brittle material, particularly in the heat-affected zone near the weld. These brittle areas frequently are severely stressed by shrinkage of the part and the weld metal during cooling. Sometimes this shrinkage stress alone is enough to cause the brittle area to fail and the weld metal to spall or peel. More frequently, however, working stresses on the part

when in service add to the shrinkage stresses and cause failure after the part has been put in service. Look for materials of this kind in large, low- or medium-alloy parts and also in small, high-alloy parts.

Remember that almost any part can be hardsurfaced by using proper procedures. But be sure to check the composition of the part under study to determine what procedure to use.

Electrode Selection

ELECTRODE SELECTION is simply a matter of matching the job requirements to the electrode characteristics. Electrodes can be divided into five groups. The groups are given names which indicate their outstanding characteristics. Beyond this, each electrode has special characteristics which may make it particularly suitable to specific applications not indicated by group title. The following describes the principal characteristics of each of the Lincoln group of electrodes. The accompanying chart compares these electrodes on the basis of major hardsurfacing considerations.

Group I: Maximum Abrasion

These electrodes are of the chrome-carbide type and have all their properties described in the metallurgy section.

1A, Chrome-carbide powder—The powder is spread over the surface. It is fused to the surface with a carbon arc or carbon-arc torch. It has mini-

mum admixture, highest abrasion resistance, and can be deposited in very thin layers and on thin edges.

1B, 1C, Chrome-carbide coated tubular electrodes—One of the two in this subgroup has higher carbide and higher abrasion resistance. The other provides the best impact resistance.

Both are applied in the usual manner with the metallic-arc process.

Deposits cross-check on cooling to relieve shrinkage stresses. Both have good resistance to corrosion and high-temperature oxidation.

To obtain maximum abrasion resistance with the electrodes, keep admixture with the base metal to an absolute minimum. Cooling rate has little effect on the results.

Group II: Abrasion and Impact

2A, Semiaustenitic type—This electrode produces a semiaustenitic deposit which has good resistance to both abrasion and impact. Its abrasion resistance is relatively unaffected by welding procedure, but its hardness will vary considerably, depending on cooling rate. Maximum hardness is obtained with large electrodes and preheats in the temperature range of 600 F. This amount of preheat produces a deposit that is almost entirely martensitic. Faster cooling rates produce deposits that have more austenite.

It is important to avoid brittle structures in the heat-affected zone of



PROPER APPLICATION of hardsurfacing material will extend the life of parts.

the base metal. For best results use a procedure on the first pass that gives maximum admixture with a slow cooling rate. Procedures on the second pass will have little effect on the abrasion resistance of the deposit. Remember that if, for some reason, it is desired to have a high hardness (even though hardness is not an indication of abrasion resistance with this electrode) use a preheat in the temperature range of 600 F and peen each bead.

Group III: Severe Impact

These electrodes give fully austenitic deposits that will withstand severe pounding with out failure.

3A, 3B, 11 to 14% manganese steel—The deposits produced by these electrodes have a high carbon content and work-harden rapidly, although not as fast as deposits in Group II. Manganese deposits are widely used for buildup on manganese-steel castings. They are frequently covered by two layers of a more abrasion-resistant material.

One type is an iron powder low-hydrogen coated electrode with high deposit rates for fast buildup on manganese and carbon steel. It also is used to join manganese steels and to weld manganese steel to carbon steel.

The second type is a solid bare electrode for building up edges, depositing very thick beads and for out-of-position welding.

Do not preheat manganese steel parts above 200 F. However, it may

be advisable to use temperatures up to that amount to relieve internal stresses already in the casting and to equalize the cooling rate of the deposit. In depositing the electrodes it is a good idea to peen each bead while it is hot to relieve shrinkage stresses and reduce distortion. Skipping around the work, putting a bead in one spot and then moving to a different area avoids overheating and tends to equalize shrinkage stresses in the part. Never permit the welding heat to raise the temperature of the work above 500 F.

3C, Stainless—Stainless electrodes have excellent corrosion resistance and are used as surfacing deposits to resist corrosion. They also are frequently used to insure a good bond between a base metal of doubtful quality and subsequent hardsurfacing deposits. On such applications one layer of stainless steel deposit is put or "buttered" on the base metal. The hardsurfacing deposit is then put over the stainless. Stainless is also used where it is necessary to put on more than two layers of Group II. In this case one layer of stainless is deposited between each two layers of Group II to provide a cushion for increased impact resistance.

Group IV: Tool Steels

4A, 4B, Tool steel—These two high-carbon, high-alloy martensitic electrodes have exceptionally good edge strength and are most widely used on tool-steel applications. One type is used on all tool-steel applications except those involving high temperatures. The other is used where high temperature properties are required.

Both electrodes are used for the fabrication of composite tools and are frequently put on hardened tool steels. When the latter is done use preheats in the temperature range of 900 to 1,000 F, or as high as possible without softening the base metal. These electrodes may be heat-treated to obtain a wide range of properties suitable for a variety of applications.

Group V: Rolling and Sliding Friction

5A, 5B, Low Carbon Martensite—These low-carbon martensitic electrodes resist rolling and sliding friction. Because of their relatively low hardenability they also are used for buildup operations on steel parts prior

to finishing layers of hardsurfacing materials. Of the two, one electrode has slightly higher alloy content and abrasion resistance. Its operating characteristics are particularly suited to depositing very thin beads.

The other type, along with preheat, is used when it is desired to obtain machineable deposits. Because of its smooth arc and high deposition rate it is the most popular electrode for buildup under other hardsurfacing.

These deposits have the best abrasion resistance when deposited with procedures which give the fastest cooling rates. By contrast, when it is desired to have machineable deposits, procedures which give the slowest cooling rate, including a preheat of 200 F, should be used. On special applications, remember that these deposits can be annealed for maximum machineability and reheat-treated to restore their initial hardness and abrasion resistance.

Deposits made by the 5B electrode react similarly to those of 5A except that it is not normally possible to obtain machineable deposits with 5A in the as-welded condition.

Application

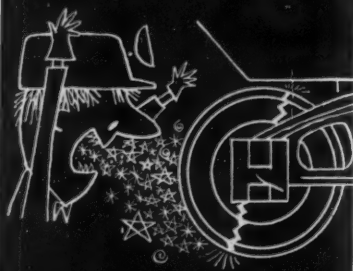
PREPARATION for welding includes cleaning the work, preparing the surface, filling depressions, buildup and preheat when required. Some applications do not require all these steps, while others require close attention to each detail.

Preparation for Welding

Cleaning the Work—Rust, grease, oil and dirt must be removed from the work before welding. If not, they may cause porosity in the weld metal and reduce the quality of the job.

Preparing the Surface—Some base metals work-harden, squash over or crack in service. The surface should be repaired before depositing hardsurfacing materials. One method is to grind off the top thin layer of worn-out metal. Another method is to deposit a layer of mild or low-alloy steel, (Group IV) before proceeding with further hardsurfacing. (For worn-out manganese steels apply Group III electrodes.) In some cases a slight preheat is sufficient to insure proper fusion without additional surface preparation. Major cracks should be cut out and repaired.

cuss words won't help



load support wheels by acf will



ACF Mine Car Wheels slash down time because the quick chilled treads have a harder, more uniform abrasion-resistant surface for longer life under rugged conditions. No flats because the tread is ground concentric to the bore. The gray iron centers cut mounting costs, reduce vibration and the effects of stress concentration. Important, too, are the reinforced overhangs which stop "break-offs." For proven maintenance economy, use ACF wheels for replacement on any mine cars.

AMERICAN CAR AND FOUNDRY
Division of **ACF Industries, Incorporated**
750 Third Avenue, New York 17, N. Y.

SALES OFFICES: NEW YORK • PHILADELPHIA
WASHINGTON, D. C. • HUNTINGTON, W. VA.
CLEVELAND • CHICAGO • ST. LOUIS • SAN FRANCISCO

Filling Depressions—Some areas of working surfaces spall or wear faster than others. If an even surface is desired on the finish, the depressions should be rebuilt before applying hardsurfacing. Use electrodes in Group IV on steel and Group III on high-manganese steels for rebuilding the depressions.

Buildup—"Buildup" is a low-alloy deposit between the original surface and the higher alloy hardsurface. It is used because it is inadvisable to use more than two layers of high-alloy hardsurfacing material. It is applied on excessively worn parts to bring them to within $\frac{3}{16}$ to $\frac{3}{8}$ in. of the finish. Group IV and Group III are used on steel and manganese-steel parts, respectively.

Preheating—The base metal of some parts is such that the part may fail from thermal shock of welding or may create brittle areas, particularly in the heat-affected zone. Failure may be due to shrinkage stresses and/or stresses incurred during service. Preheat is a means of satisfactorily welding steels so that failure does not occur.

In the case of very hard steels with high internal stresses, preheat tends to relieve the stresses and reduce the effect of the thermal shock. On any hardenable alloy steel, preheat slows the cooling rate so that there is less opportunity for brittle structures to form. It also provides more uniform cooling, thus fewer stresses are built up within.

It is good to be sure that parts being hardsurfaced are at least 75 to 100 F. During the summer this is seldom a problem as the ambient temperature is well above 75 F. However, in the winter when parts are brought in from the outside or even if the temperature in the shop is permitted to drop below 75 F it is quick insurance to run a flame torch over the parts to be sure that they are up to the desired temperature.

Note that preheat, generally, should not be used to eliminate cross-checks or hairline cracks which run across the beads of higher-alloy hardsurfacing materials. These fine cracks, generally, are beneficial in that they relieve shrinkage stresses and help avoid more serious cracks. Deposits of the Faceweld electrodes in Group I, for example, are designed to cross-check and may do so even with preheats in the neighborhood of 1,200 F.

When to Preheat—Aside from taking the chill off the part, preheat, normally, is not required except for alloy steels or very thick parts. The higher the alloy content and the thicker the metal, the greater the need for preheating. The amount of preheat can be determined by applying the following thumb rules:

1. It is not necessary to preheat mild- and medium-carbon steels except on very heavy parts.
2. Preheat high- and medium-carbon, high-alloy steels.
3. It is frequently advisable to preheat large manganese (12 to 14%) steel parts with locked in stresses to about 200 F. However, do not let the work get above 500 F.
4. Always preheat, slowly and uniformly, cast iron to 500 to 700 F.
5. When in doubt, preheat 500 to 700 F and slow cool. (Be sure it is not manganese steel. The non-magnet properties of manganese steel make it easily identified with permanent magnet.) Wherever possible, determine the base metal analysis and check to determine whether or not preheat is necessary and, if so, how much is required. Always determine whether or not the material is cast iron or manganese steel.

Where to Slow Cool—Normally, unretarded cooling in still air at room temperature is adequate. Occasionally, on jobs where undesirable cracks occur during cooling, it is advantageous to reduce the cooling rate by post-heating or by covering the part with asbestos or sand while it cools.

Technique

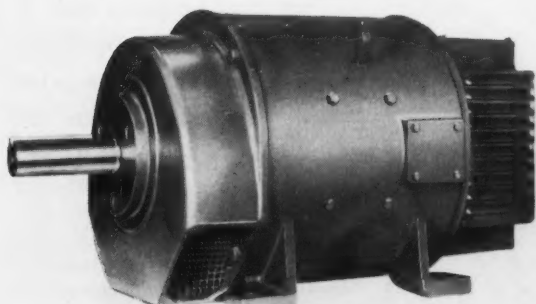
The technique used to deposit hardsurfacing materials influences both the cooling rate and alloy content of the part. Small beads made with small electrodes and low currents on thick heavy parts have the fastest cooling rate and least admixture with the base metal. Using two layers also reduces admixture. In contrast, single-layer deposits made with high currents, large electrodes and large weave beads have the greatest amount of admixture and slowest cooling rate. Therefore, procedures may have considerable effect on the final properties of the hardsurfacing deposit, depending on how cooling rate and admixture influence the deposit of the particular electrode being used.



Tough Reliance D-c. Motors power this mechanical mule

Powerful new Reliance Super 'T' D-c. Traction Motors put muscle in this low-slung mine tractor. Two low-voltage, battery-oper-

ated 5 hp. motors pull a 20-ton pay load at speeds up to 6 mph. Operation is smooth and equally responsive in forward or reverse.



These Reliance Traction Motors, used by a wide variety of manufacturers, withstand punishing overloads in starting loaded trains. Operating conditions are damp and gritty. In spite of this damaging environment, Reliance D-c. Motors have given years of reliable mining service.

This is typical of the performance you get from all Reliance products. Your nearest Reliance Sales Engineer will give you all the pertinent facts. Call him, or write for bulletin C-2501.

C-1004-A

Product of the combined
resources of
Reliance Electric and
Engineering Company and its
Master and Reeves Divisions

RELIANCE ELECTRIC AND
ENGINEERING CO.

DEPT. 69A, CLEVELAND 17, OHIO
Canadian Division: Toronto, Ontario
Sales Offices and Distributors in Principal Cities

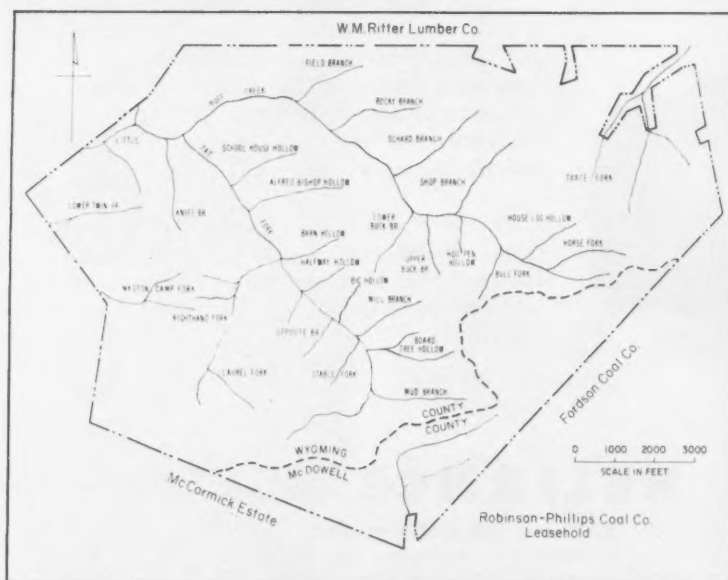


Duty Master A-c. Motors, Master Gearmotors, Reeves Drives, V+S Drives, Super 'T' D-c. Motors, Generators, Controls and Engineered Drive Systems.



VIEW OF THE PROPERTY shows main haulage road and excess roads to the mines. Distance from the mines to the preparation plant is approximately $3\frac{1}{2}$ mi. Three miles of roadway had to be constructed before reaching the coal deposit.

Development of a New Mine



PROPERTIES of the Robinson-Phillips Coal Co. aggregate 12,600 acres containing an estimated 30 million tons of coal in the highly regarded Red Ash seam.

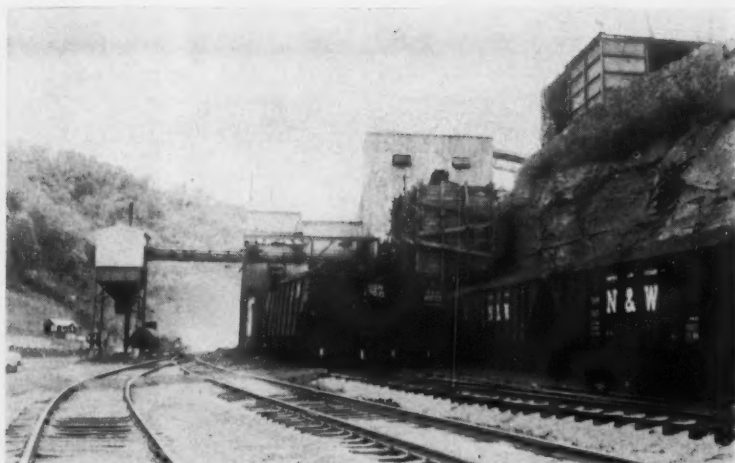
How Robinson-Phillips Coal Co. acquired property and developed it into a profitable mining operation after other mining men had given the same property "thumbs-down."

THOUGH considered by many as "too risky to invest in," the Douglas No. 2 property at Baileyville, W. Va. has proved out for its owners, the Robinson-Phillips Coal Co. The property, on 12,600 acres and containing one seam of low coal, was leased from the West Virginia Land Co. In its present stage of development it includes eight deep mines and one auger operation, plus a modern preparation plant.

Hidden opportunities, plus re-



TOP OFFICIALS—Claude Phillips, president and general manager, and Leonard Phillips, vice president.



PREPARATION PLANT cleans and sizes coal from the Douglas Red Ash seam to produce a premium coal. The plant processes an average of 2,000 tons daily from deep and auger mines. It is served by the Virginian Div. of the Norfolk & Western Ry.

Robinson-Phillips Background

The Robinson-Phillips Coal Co., with properties comprising contiguous area of 12,600 acres and estimated reserves of more than 30 million tons of recoverable coal (60 yr at 2,000 ton per day) is a privately-owned company with headquarters at Beckley, W. Va., and operating offices at Baileyville. At the helm of the organization are Claude Phillips, president and general manager; Leonard Phillips, vice president; and Seth Phillips, secretary.

Located in the bituminous coal region of southern West Virginia, the company's property lies about 50 mi southwest of Beckley and approximately 60 mi northwest of Bluefield. The larger portion of the holdings is in Wyoming County but they also extend into McDowell. The

company is served by the Virginian Div. of the Norfolk & Western Ry. The operation consists of deep and auger mines and a modern preparation plant.

Mining is carried out in the Douglas Red Ash seam. This particular seam is found only in certain areas in this section of the state. The product is a premium coal that is much in demand. The coal is sold by the Maryland Coal & Coke Co., Richmond, Va.

The Robinson-Phillips Coal Co. has recently leased the Twin Branch property located at Davy, W. Va., formerly operated by Ford Motor Co. and most recently by Jones & Laughlin Steel Co. This lease contains 9½ million tons of Sewell coal. The company plans to produce approximately 1,200 tpd.

sourcefulness and determination, have resulted in a profitable operation. Two outstanding assets are (1) substantial reserves—60 yr at a daily production rate of 2,000 tons, and (2) a premium coal that satisfies the most demanding customers.

The average moisture and ash content, for example, on sizes ranging from 8x4 to ¼x0 is 2.15% and 2.21%, respectively. The accompanying table shows typical analysis of the various sizes prepared at the Douglas No. 2 plant.

Geological characteristics and seam conditions dictate the types and methods of mining employed by the company. Deep mines are set up and operated on the punch-mining system because the seam lies close to the tops of the mountains and distances from the outcrop to the opposite side range

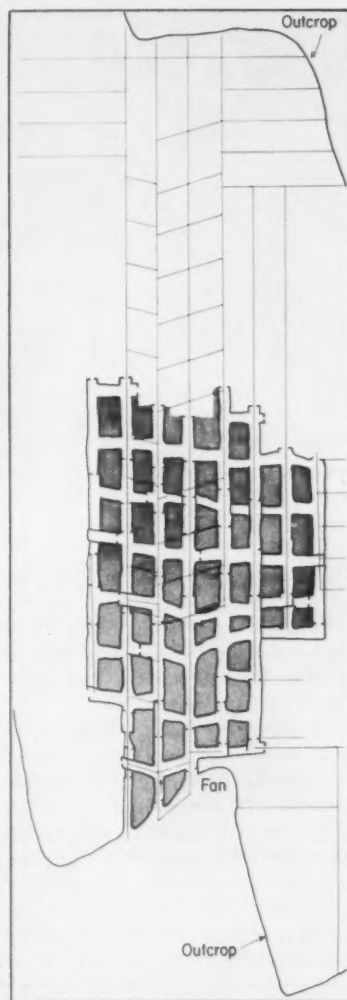
from 2,000 to 7,000 ft, with the western end of the property running under deeper cover.

Augering supplements punch mining and also develops the property for future deep mines.

Development

Initial development started in October, 1957. This included excavating for the railroad and preparation-plant site, and constructing 3 mi of road to reach the coal deposit. The first stage was completed in the spring of 1958, when the railroad and the first phase of preparation-plant construction were completed.

Actual production did not begin until September, 1958, when the road to the coal seam was completed. Initially, the operation included stripping



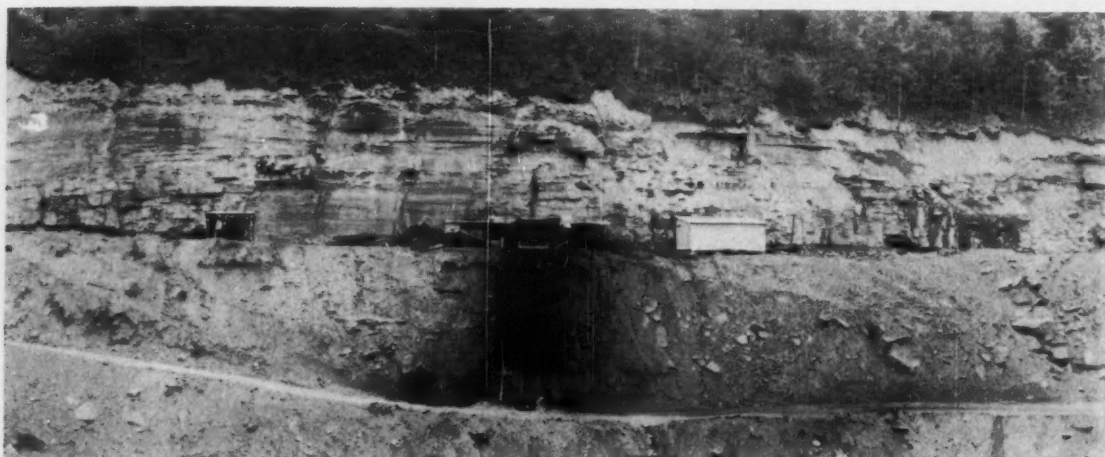
TYPICAL PUNCH-MINING PLAN employed to produce coal from the eight mines located on the property.



COAL is cut with bottom machines in the 32- to 36-in-high Red Ash seam. Cutters are equipped with 7½- and 8-ft bars.



BATTERY-POWERED TRACTORS and specially made trailers haul coal from the face to the outside.



TYPICAL PUNCH MINE shows the essentials needed on the outside to produce from 160 to 350 tpd. Storage bin is constructed below seam level to permit trucks to drive under the bin and load. Size of bin is determined by the size of the mine.

and augering. Stripping served two purposes in the beginning: (1) coal production could start immediately upon reaching the coal seam and (2) roads to the sites of future deep mines could be constructed.

Augering followed the stripping operation to increase daily production and recover as much coal as possible.

After sufficient roads along the outcrop were constructed and mining territory was opened up, stripping was discontinued. This took place in February, 1959, as deep-mine production reached the desired output. However, there are areas on the property where stripping will be the only economical means of recovering the coal. But these pockets are small and no stripping is planned now or in the

Douglas No. 2 Seam Coal Analysis (As received)

Coal Size	8 x 4	4 x 1½	1½ x ¾	1 x ¼	¼ x 0
Moisture.....	1.71	1.77	1.64	2.38	3.28
Ash.....	2.06	1.76	1.78	1.99	3.46
Volatile.....	25.34	25.50	26.06	25.22	24.48
Fixed carbon....	70.89	70.97	70.52	70.41	68.78
Sulphur.....	0.68	0.64	0.70	0.60	0.92
Btu.....	15,047	15,192	15,143	14,991	14,608
Fusing temp. (F)	2,710	2,410	2,395	2,405	2,355
FSI #.....	9	9	9	9	9

foreseeable future for good reason.

Coal quality was the major reason for discontinuing stripping operations. Without strip coal the company can produce a better end product. Too, its markets prefer a deep-mined coal.

Auger operations are being continued to supplement deep-mine prod-

uction and also to construct roads along the outcrop for future deep mines.

The final stage of the development program consisted of adding a Jeffrey jig and associated equipment to the preparation plant. Installation was completed in July, 1959.



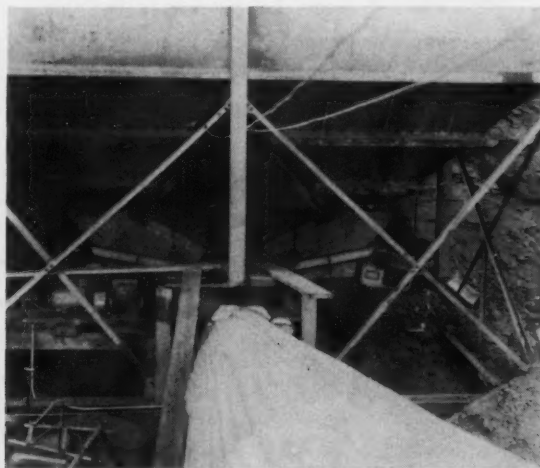
AUGER OPERATION develops property for future deep-mines. Space is left along highwall for deep-mines.



DOZERS lined up for the day's work are used with the auger and also to build access roads and other construction work.



TWIN STEEL-CONSTRUCTED STORAGE BINS have a capacity of 150 tons each. A wood bin has a 360-ton capacity.



VIBRATORS under storage bins feed onto a 36-in belt conveyor. Coal can be fed from both bins at the same time.

Deep Mining

The company has, as previously noted, eight punch mines on the property. Production ranges from a low of 160 tpd to a high of 350, depending on the size of each mine.

Layout of the property requires that the auger operation leave space for a deep mine every $\frac{1}{2}$ mi. This does not mean that there is a mine at each of these spots, but since augering advances more rapidly than deep mining, it could prevent deep-mine development unless provision was made in the augerpass.

Mining is in the Douglas Red Ash seam, which occurs near the tops of the mountains. Seam thickness ranges from 32 to 36 in. The top and bottom

consist of high strength blue slate.

The mining plan is room-and-pillar. A map of a typical mine is shown in the accompanying illustration. Headings and rooms are driven 24 ft wide on 60-ft centers. This plan permits 80% recovery of the coal.

Each mining plan may be slightly different, depending on the mine location with respect to the outcrop and distance through the mountain.

Depth of mines varies from 1,500 to 3,000 ft. The number of headings may vary from six to eight, again depending on the mine. The mining plan illustrated shows eight headings. The two headings which were picked up on the right and approximately 200 ft inby will eliminate driving entries to the right near the outcrop on the op-

posite side of the mine.

General practice is to drive the headings to the outcrop and mine to the right and left on retreat.

Roof support is provided by posts except in a few areas where cross bars are needed. Posts are set on 4-ft centers.

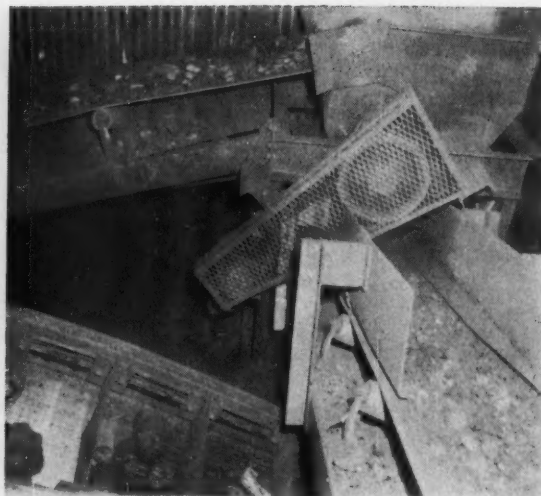
Goodman and Jeffrey machines are used to cut coal at the various mines. These machines are equipped with 7½- and 8-ft bars and have feeds of 32 fpm.

Haulage equipment consists of Kersey battery-powered mine tractors, Model HT 8, and specially made 2½-ton trailers, Model 66.

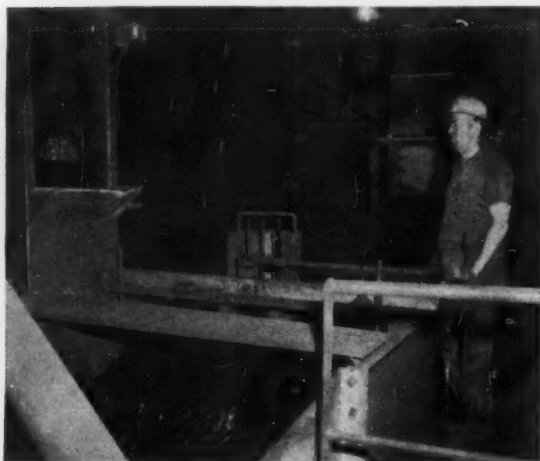
Coal is brought to the outside with the tractors and trailers and discharged into storage bins. Bin capaci-



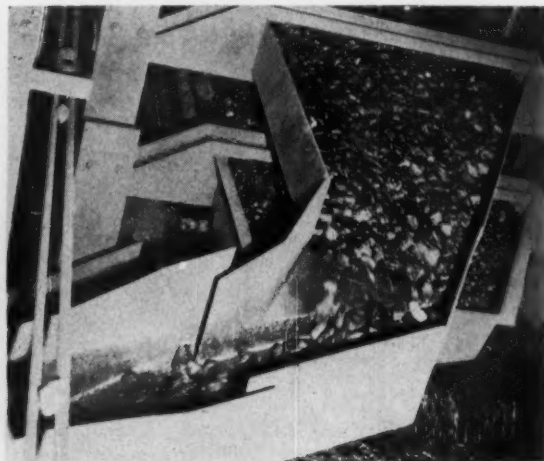
DRY SHAKER separates $\frac{1}{4}$ x0- and 8x4-in coal for loading directly into railroad cars. The $4 \times \frac{1}{4}$ goes to the washer.



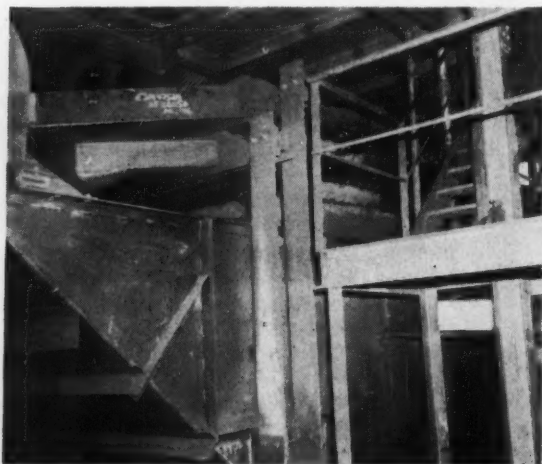
BELT CONVEYOR (top) transfers the $4 \times \frac{1}{4}$ product onto belt (right) which conveys it to the washer.



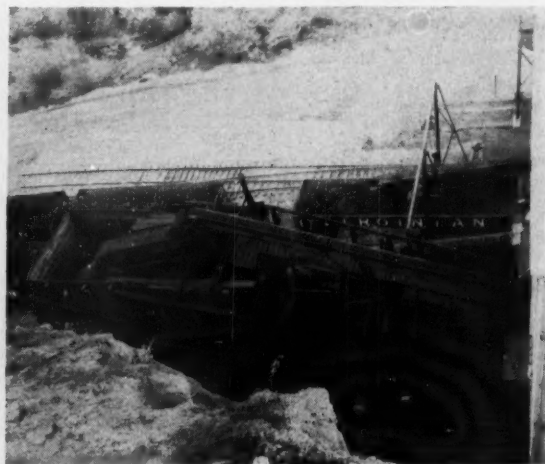
WASHER cleans $4 \times \frac{1}{4}$ product to upgrade coal quality. Clean coal is sluiced to dewatering and sizing screens.



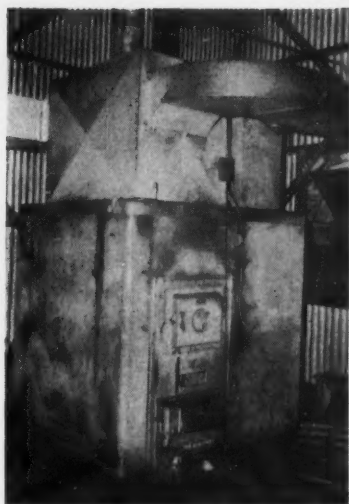
DEWATERING AND SIZING SCREENS make two products. The $4 \times 1\frac{1}{4}$ goes to loading booms and $1\frac{1}{4} \times \frac{1}{4}$ to a vibrator.



A 4,000-GAL SETTLING TANK under the dewatering and sizing screens collects water from the complete system.



NUT AND PEA CONVEYOR discharges onto a 4×12 vibrator which separates the two products for loading into cars.



FORCED-AIR FURNACE is used in the winter to keep the plant from freezing.



EQUIPMENT in the plant is electrically interlocked to interrupt coal flow in case of equipment failure, thus eliminatng damage to other equipment.

ties vary from 50 to 100 tons, depending on the size of the mine.

Haulage distance from the face to the outside is kept at approximately 2,000 ft. When distances exceed this amount, a ropeframe belt conveyor is installed to handle the coal. Bottom is taken to accomodate the belt tail, and top is removed to permit trailers to be end-dumped.

Power is supplied at 250 V DC by Caterpillar and General Motors diesel-generator sets. Capacities range from 110 to 75 kw. The decision to use diesel generators to supply power to cutting machines, fans, air compressors and battery chargers was due to the high cost that would be encountered by continually moving overhead power lines to keep up with mining operations. Initial installation cost was not the determining factor.

Auger Operation

At present the company has only one auger in operation. This is a 24-in Compton Model 28 Twin. The average daily production is approximately 300 tons with a four-man crew.

Three augers are owned by the company. Two are 24-in Model 28 Twins and the other is a 36-in Model 28 single.

The auger is used primarily to develop the property for future deep-mine sites. One unit manages to stay well ahead of deep-mine developments.

Transportation

Coal from the storage bins at the deep mines and the auger operation is hauled to the preparation plant by 20-ton trucks. Average haul distance is approximately 3½ mi. This includes the 3 mi of road constructed in the initial development to reach the coal deposit. A 4% grade is maintained on all roads with the exception of a few extremely difficult areas. Approximately 80% of the loaded cycle is down grade. A round trip including loading and unloading requires from 30 to 45 min.

Coal is unloaded at the preparation plant into two 150-ton steel storage bins and one 360-ton wood bin. Total storage capacity is 660 tons.

Preparation

Coal from the two steel storage bins is fed by two Jeffrey vibrators onto a 36-in belt conveyor which discharges onto an Irvin McKelvy shaker screen. The wooden bin is equipped with a 16-in chain conveyor which also discharges onto the 36-in belt.

Plant feed is controlled by the operator. Jeffrey feeders are equipped and controlled by rheostats at the operator's control station. Coal can be fed from both bins at the same time and at any desired rate. Feed from one bin, for example, can be 150 tph and the other 50 tph. Coal also can be fed from one bin.

The dry shaker is equipped with ¼-, 4- and 8-in screens. Slack (¾x0) is separated and loaded into railroad cars. The 4x¼ product is united with the 8x4-in after it has been hand-picked. Plus 8-in is crushed to minus 8-in and united with the 8x¼ product.

The 8x¼ is then discharged onto a 4x12 Allis-Chalmers triple-deck Ripl-Flo vibrator. Top product (8x4-in) goes by drag conveyor to a belt loading boom. Middle, 4x¼ coal, is transferred by belt conveyor to the Jeffrey jig. Final ¾x0 separation is made on the lower deck.

Clean coal from the washer is sluiced to a Jeffrey dewatering and sizing screen where 4x1¼ and 1¼x¼ sizes are made. The 4x1¼ (stove) is loaded into railroad cars. Nut and pea (1¼x¼) are conveyed by transfer belt to a 4x14 Lecco vibrator located above two 70-ton storage bins. One bin is for 1¼x¾ nut and the other for ¾x¼ pea.

Refuse from the washer goes by elevator and conveyor to a refuse storage bin for disposal by trucks.

The dewatering and sizing screens making the stove, and nut and pea are located above a 4,000-gal settling tank. All water in the system is collected in this tank. Part is used to prewet 4x¼ coal going to the washer. Approximately 50 gpm goes to the disposal area. This same amount is added to the system by a battery of sprays located over the screens and tank.



NEW SHUTTLE CARS carry a bigger payload faster and safer in thin coal at Lancashire No. 15 mine. Unit is hinged in middle, has six wheels. Greater safety and comfort for operator contribute to shorter trip time.

Better Section Haulage Boosts

Larger shuttle cars carrying 30% more payload while traveling at faster speeds, and new 36-in panel belts enable continuous miners to advance 20 ft more per shift.

NEW SHUTTLE CARS carrying bigger payloads at faster speeds are helping solve the section-haulage problem in 40-in coal at Lancashire No. 15 mine, Barnes & Tucker Co., Elmore, Pa. Also contributing to more efficient section haulage are new 36-in panel belts that enable the new cars to discharge at full speed and thus shorten trip time.

Continuous miners now advance an additional 20 ft per shift because the more efficient haulage units make possible more productive time. Carrying up to 4½ tons, the Joy 18-SC cars haul 30% more per trip than conventional cars. They discharge this payload in 30 sec.

Greater safety and more operator comfort also contribute to faster shuttle car travel speeds and shorter trip times. Incorporating a hinged-center design, the car is able to follow the irregularities of the bottom. The car operator rides near the center and thus is not bounced around as much as when driving a conventional car.

These latest additions in a continuing program to improve methods date

back to early 1959 when the first 36-in 450-fpm belt conveyor went into service to relieve a bottle-neck created by the slow discharge of shuttle cars on 30-in belts running at 250 fpm. Installation of the first 36-in belt solved the slow-discharge problem

with the standard 3-ton shuttle car. Consequently, management set up a replacement program for all 30-in belts. By Feb. 1, 1960, three 36-in belts, including Jeffrey and Huwood units, were in service and plans call for all 30-in belts to be replaced by the end of the year.

Management saw an opportunity to further improve section productivity if transportation from the face to the higher-capacity belts could be improved. As a consequence, the com-



CONTINUOUS MINERS carry the production load in room-and-pillar mining. Each unit is able to advance an additional 20 ft per shift since new shuttle cars and belt conveyors went in service at Barnes & Tucker.



NEW PANEL BELTS, 36 in wide and traveling 450 fpm, take full discharge of shuttle car, which can unload 4 tons in 30 sec.

Continuous-Miner Output

pany decided to try a pair of Joy 18-SC hinged-center shuttle cars as an answer to the problem. Two of the cars arrived in May, 1959, and were put to work with a Jeffrey Colmol in room-and-pillar work.

Section production climbed with use of the two trial cars and on the basis of their performance Barnes & Tucker placed orders for 12. These cars were to incorporate minor design changes to enable them to better fit Lancashire No. 15 conditions. Mine manage-

ment reports that in hauling 85,000 tons of coal between May, 1959, and January, 1960, the only maintenance required on the two trial cars was replacement of a light switch.

Four of the new cars arrived in the first week of January, 1960, two of which replaced the two trial cars. Two more arrived 2 wk later and six more are scheduled for later delivery.

Car Features

The hinged shuttle car has two

10:00x15 drive wheels mounted in the center. A 15-hp gearmotor drives each wheel through a chain-and-sprocket arrangement. There are no wheel units. The two drive wheels are attached to the main frame by set screws on stub axels for easy replacement.

At each end of the car are two 9:00x10 wheels which provide 4-wheel steering.

Over-all length of the car is 26½ ft and width is 8 ft.

Travel speed is better than 4 mph on level ground. It takes 25 sec for the conveyor chain to make one revolution.

Mining Conditions

Lancashire No. 15 production comes from the Lower Kittanning seam whose thickness ranges from 39 to 42 in. It is friable and virtually free of partings.

Most of the seam is overlain by firm shale which provides a good roof when it is more than 3½ ft thick. A 6- to 12-in layer of hard fireclay under the coal provides a firm roadway for shuttle cars.

Present mining areas are under 450 to 550 ft of cover and are in the bottom of a basin. Main headings now are being driven uphill on a 2% grade. Butt headings are driven 90 deg with the mains.

Roof is supported by straight posts set on 4-ft centers along both sides of a 14-ft roadway for shuttle cars.

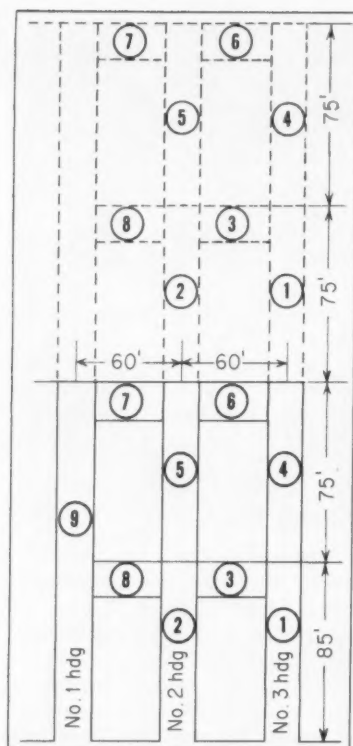
Mine openings are driven 16 to 18



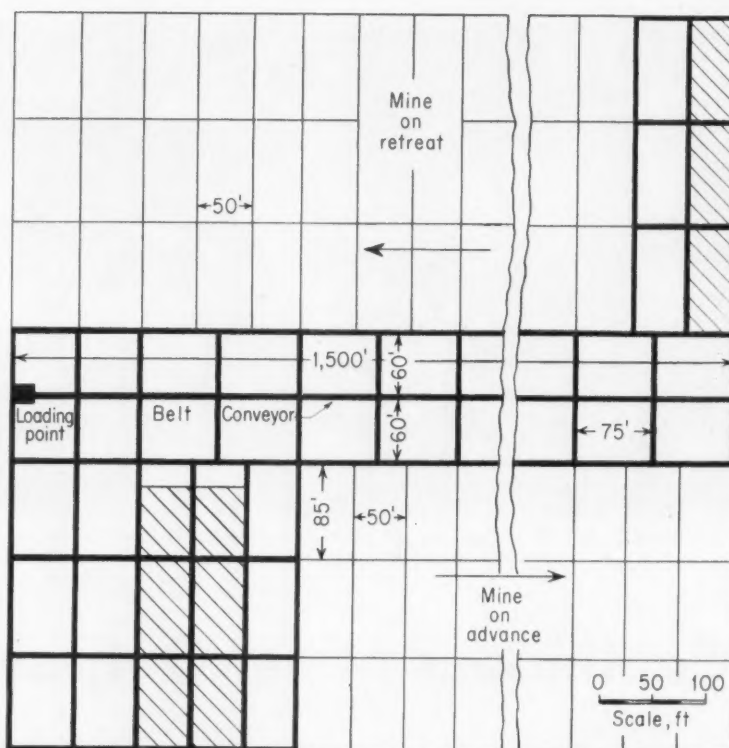
STEEL MINE CARS with automatic couplers receive 7-ton load from panel-belt discharge chute. Coal travels from loading point to main sidetrack in 28-car trips.



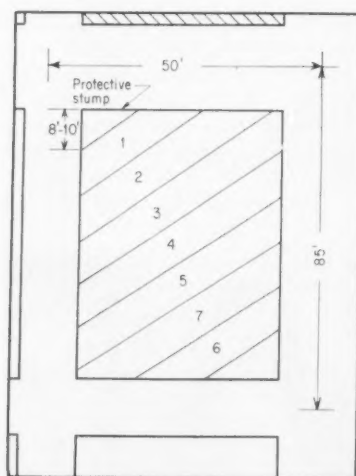
KEY MEN meeting in Lancashire No. 15 mine office are Lewis Robbins (left), chief electrician; John Todhunter, general manager; and George Dunchuck, superintendent.



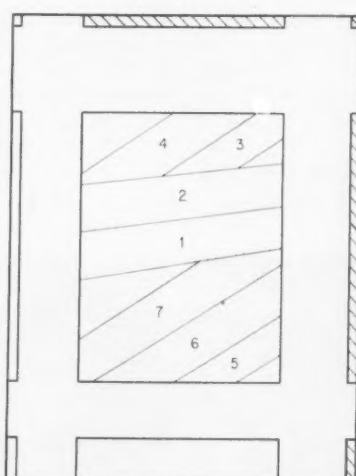
MINING SEQUENCE in room panel includes nine separate moves, starting in No. 3 heading and ending in No. 1.



ROOM-AND-PILLAR METHOD calls for driving rooms and extracting pillars on one side as the headings advance and recovering the other half on retreat. Panel entry is 1,500 ft deep with rooms on 50-ft centers.



PILLAR RECOVERY is usually carried out with angled lifts driven the width of the continuous miner as shown in left sketch. When caving follows mining closely, plan at right is used.



ft wide by taking two passes with the Colmol. In starting a heading the continuous miner advances 18 ft along the right rib, then drops back and mines 36 ft along the left rib. Mining then alternates from side to side in 36-ft advances. Breakthroughs

and rooms are driven the same width as headings.

In extracting room pillars the continuous miner attacks the block at an angle, leaving a small triangular-shaped stump 8 ft from the in by corner. This stump is recovered later if

roof conditions permit. The miner takes successive parallel slices from the pillar, which leaves a small triangular block. This block is recovered by taking a slice along the gob side and then recovering the remainder as the last step before starting in a new pillar.

When caving follows mining closely an alternate plan is followed. Two lifts are cut through at the middle of the pillar, then the inby block is recovered in two lifts driven from this new protected roadway. The remaining block is recovered from the room breakthrough.

A standard crew in a continuous miner section is as follows:

- 1 miner operator
- 1 miner helper
- 2 shuttle-car drivers
- 1 timberman
- 1 boom operator
- ½ mechanic
- 1 foreman
- Total, 7½

Panel Mining

Barnes & Tucker employs a Jeffrey Colmol with two of the 18SC shuttle

7th

Dravo 3200 towboat enters service... two more available for early delivery

The *Albert F. Holden*, newest Dravo-built 3200-horsepower towboat, has joined the fleet of Island Creek Fuel and Transportation Co., a subsidiary of Island Creek Coal Company, Huntington, W.Va. She is being used to push tows of coal on the Ohio River between the firm's terminals at Huntington and the Cincinnati and Pittsburgh areas.

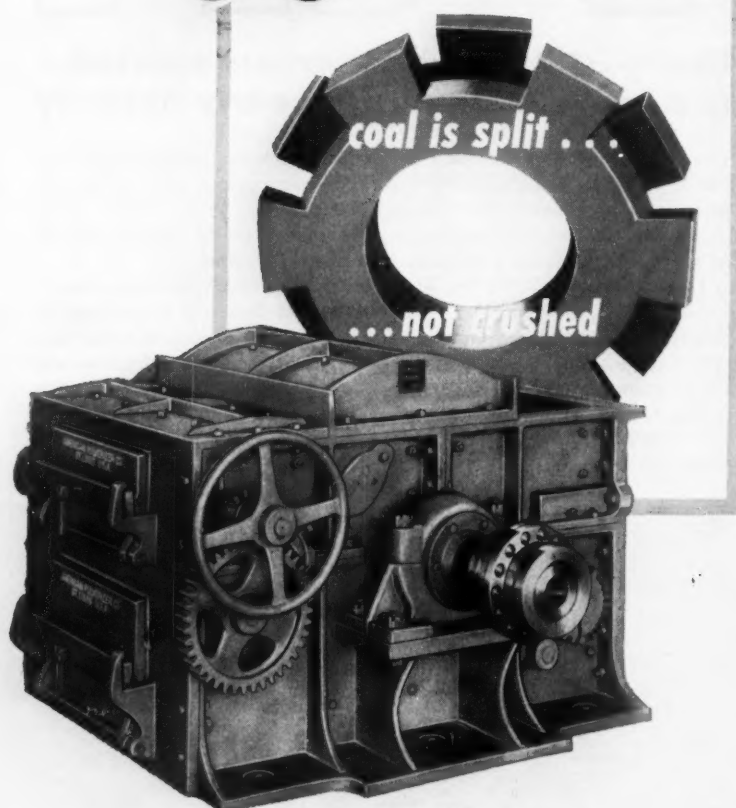
Like all Dravo 3200's, the *Albert F. Holden* offers operating advantages made possible only by Dravo's *Precision-Balanced Propulsion*. In this system, all basic propulsion elements are designed and tested as a unit to give lowest ton-mile cost, resulting from greater push-power and better maneuverability. We'll be glad to supply facts and figures on how a Dravo 3200 can increase your towing efficiency and profits. Write or call Marine Department, Dravo Corporation, Pittsburgh 25, Pennsylvania; SPalding 1-1200.



DRAVO
CORPORATION

PERFORMANCE-PROVED

OVER 50 YEARS



American Rolling Ring Coal Crusher

In 1908 American Pulverizer patented the rolling ring principle of coal reduction. Today there are thousands of American Coal Crushers in operation ranging in size from Sample Crushers to Crushers having a capacity of 800 tons per hour.

American manufactures reduction equipment exclusively, backed by a half century of experience in the production of coal reduction equipment. Although improvements have been consistently made in American Crushers, the rolling ring principle still remains the most efficient method of coal reduction. This fact is **performance-proved** by hundreds of "cost of operations" reports from customers of American Rolling Ring Coal Crushers. May we have our engineers analyze your reduction problem?

Complete Literature Available. State your tonnage requirements.

"When you figure costs—the best results come from American Rolling Ring Coal Crushers."

American
ORIGINATORS AND MANUFACTURERS

PULVERIZER COMPANY

OF RING CRUSHERS AND PULVERIZERS

1119 MACKLIND AVE.

SAINT LOUIS 10, MO.

cars to develop room panels 1,500 ft deep with three headings. Breakthroughs are cut at 90 deg every 75 ft. Rooms are on 50-ft centers.

In developing the panel mining proceeds as follows: Starting at the No. 3, or right, heading the Colmol advances 85 ft; moves to No. 2 and drives 85 ft; cuts a breakthrough from No. 2 to No. 3 at 75 ft; advances No. 1 75 ft; returns to No. 2 and drives 75 ft; cuts second breakthrough from No. 2 to No. 3; cuts breakthrough from No. 2 toward No. 1 at 170 ft; cuts breakthrough from No. 2 toward No. 1 at 75 ft; drives No. 1 heading 170 ft.

After completing this cycle in the headings, a 36-in belt is installed in the No. 2 heading and two rooms are driven off the return-air side opposite the breakthroughs. The pillars between these rooms are left intact so that the No. 1 room can be used as an additional return aircourse for the main entry.

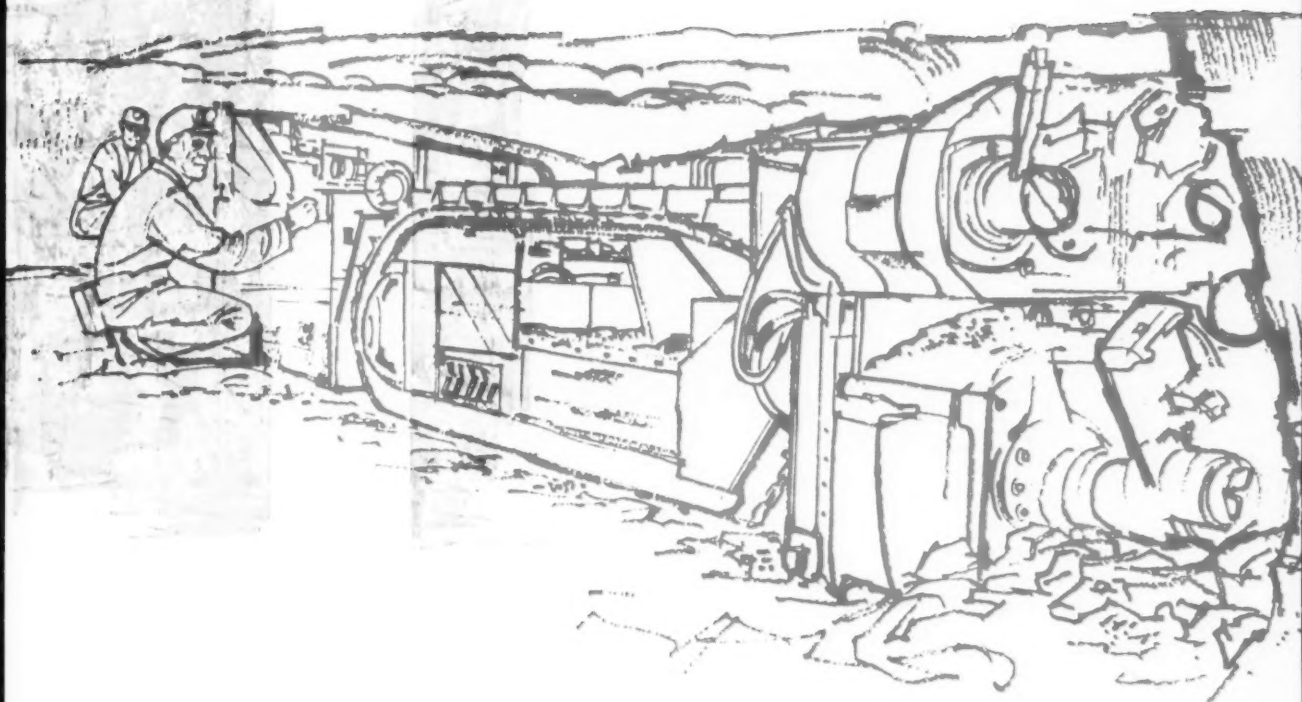
After the two rooms are completed the three headings are advanced 150 ft, after which two more rooms are driven. Before another cycle is begun in the headings the pillars between Nos. 2 and 3 rooms are extracted.

After this initial pillar work the mining sequence includes advancing the three headings 150 ft, driving two rooms and extracting the pillars between two previously driven rooms. This system continues until mining reaches the 1,500-ft limit. Then room-and-pillar work begins on the opposite side of the entry and retreats to the mouth. The pillars between Rooms 1 and 2 are left intact on this side also to provide the extra return aircourse.

Belt and Track Haulage

After making the initial belt setup in a room panel Barnes & Tucker extends the conveyor in 200-ft increments, adding neoprene belt joined with Flexco H-D splices. Belts discharge into Watt and Pennwood 8-ton steel mine cars mounted on National Malleable trucks and equipped with Willison automatic couplers. Loaded cars are assembled into 28-car trips and delivered to the main sidetrack by two locomotives, a 20-ton motor at the head and a 15-ton unit at the rear. The last leg of the journey to the surface is by 12,250 ft of rope haulage.

There are four types of Jeffrey Colmols[®]



THE PAYOFF: A NEW HIGH IN EFFICIENCY WITH THE COLMOL THAT FITS
YOUR OPERATION TO A "T". JEFFREY DOES IT WITH FOUR BASIC TYPES,
AND A NUMBER OF COMBINATIONS OF INTERCHANGEABLE COMPONENTS.



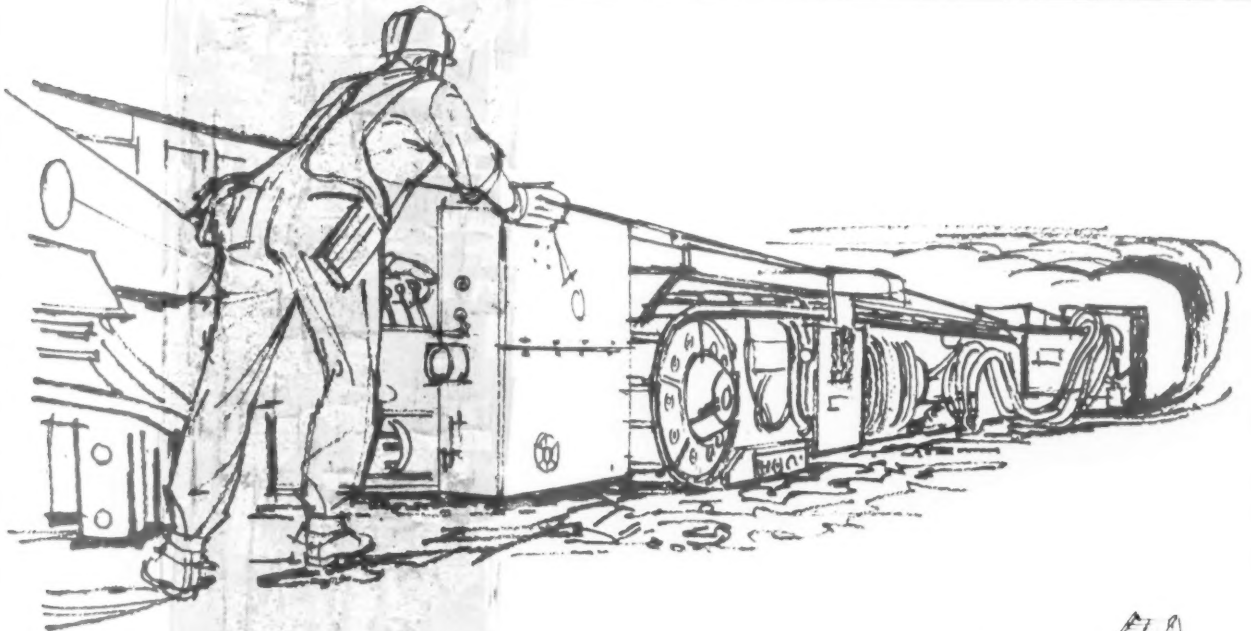
JEFFREY

JEFFREY CONTINUOUS MINING MACHINES

GENERAL SPECIFICATIONS

	86-A	76-AM	76-BM	76-CM
Maximum mining height	44"	60"	77"	96"
Minimum mining height	28"	38"	50½"	67"
Width of cut	14'-7"	9'-8"	10'-9¾"	10'-9¾"
Minimum tramming height	25¼"	34½"	48¾"	63¾"
Width over crawlers	10'-0½"	72"	77"	77"
Length	34'-3"	29'-5½"	33'-10"	33'-10"
Tramming speed (feet per min.)	22'	20'	20'	20'
Feed speed (inches per min.)	0" to 51"	0" to 36"	0" to 36"	0" to 36"
Electric motors (total HP)	190	150	190	250
Weight—approx. (lbs.)	92,000	56,000	73,000	75,000

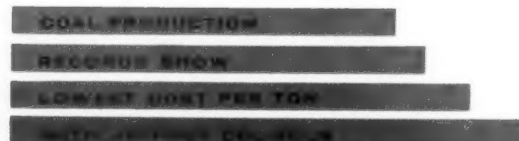
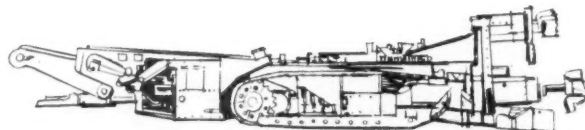
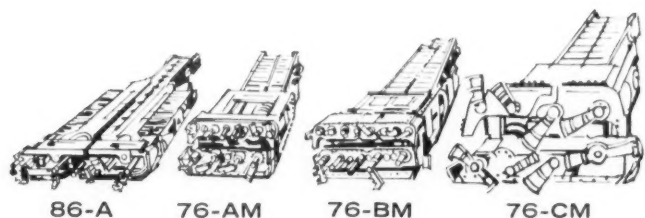
Voltage: Colmols can be built for operation on any of the following voltages:
250 V or 500 V, DC; 440 V, 3-ph, 60-cy., or 415 V, 3-ph, 50-cy., AC.



1 RANGE — Choose from four basic types. Variations within each type give the range that's ideally suited for your operation. You pay for what you need—and that's all.

2 CONTROL — Colmol mining is controlled mining. The operator is in full command, gets smooth, immediate, positive response from electric-hydraulic controls...centralized for convenience, safety, easy access...located so that the operator has an unobstructed view of cutting and discharge operations... minimum operator fatigue.

3 CAPACITY — Loading rates vary with hardness of coal, impurities in the seam, condition of roof and floor, as well as other factors. Colmol's boring principle of cutting and breaking while advancing in the coal with a minimum of waste motion, assures highest loading rates with maximum face time. Want highest possible tonnage? Then you want Colmols!



Get Facts Now — Call or write your nearest Jeffrey District Office.

The Jeffrey Manufacturing Company
912 North Fourth Street
Columbus 16, Ohio

MINING • CONVEYING • PROCESSING EQUIPMENT • TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

**COAL
AGE**

Operating Guide

Cutter And Drill Bits

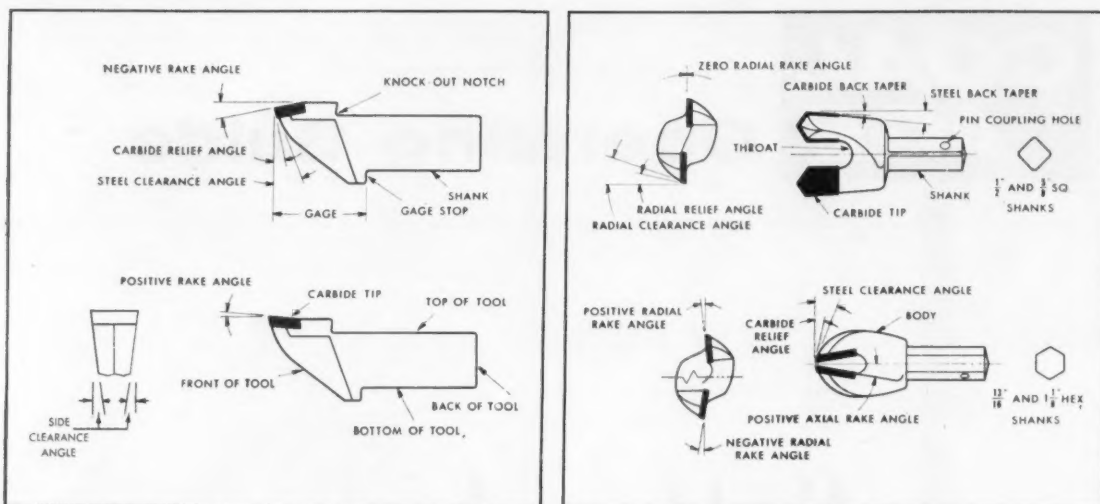
How Bits Work

Applying Bits

Tips on Sharpening

Buying Guide

Cutter and Drill Bits



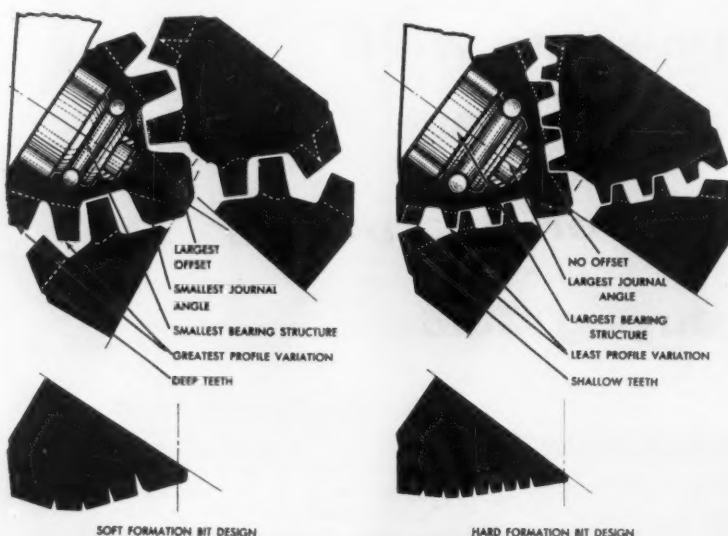
CUTTER-BIT TERMS are defined in these views of a bit. ROTARY carbide drill-bit terms are defined in these views.

Cutter and Drill Bits

Higher machine productivity and lower supply cost through longer bit life result from a positive program of bit selection, application and maintenance.

A POSITIVE PROGRAM of selecting, applying and maintaining mining bits can lead to higher productivity and lower supply costs. Higher productivity may result from more useful work from mining machines because

of fewer delays or greater penetration by drills, cutters or continuous miners. And lower supply costs are possible through careful selection of bits for specific conditions and proper maintenance.



HOW ROLLER-CONE BIT DESIGNS compare for soft and hard rock. Soft-formation bit has large, deep teeth.

How Bits Work

Drilling a hole in rock or coal, cutting coal or removing it with a continuous miner involves freeing small pieces from the large mass of coal or rock and then removing these small pieces.

Mechanical force is the medium. This force usually is applied to the rock or coal by percussion, which breaks the material by compression, or by rotary action, which breaks material by shear. Both methods produce stress in the material by wedging action at areas of weakness. A new roofbolting machine and the rotary roller-cone overburden drill bit combine the two actions. Until now most of the roofbolting units have been rotary and therefore employ shearing action. Coal cutter and continuous miner bits also remove coal by shearing action.

In selecting a bit for drilling or cutting the nature of the material rates top consideration. For instance, one or more types of rock with widely varying physical properties may be present in the overburden at a strip mine. Physical properties of each type, including hardness, grain size, fractures, strength of cementation and so on should be considered before selecting a bit for an overburden drill. These same factors also apply underground.

In choosing a bit for cutting and drilling coal the major properties to be considered are hardness, cleavage, and the presence of pyrite or clay veins.

How Rock Bits Cut

A percussion-type bit, such as on

A stopper, shatters rock through impact over a small area, then fracturing it deeper down. As it rebounds from the blow it rotates to a new position for the next blow. At the same time air or water removes the cuttings.

The bit's cutting edges concentrate the energy of the blow in a small area. Depth of penetration varies directly with the area struck and thus is greatest when the area is smallest. Since wear resistance and strength are important in bit design, the cutting edge must have an adequate cross-section area. The cutting edge on percussion-type bits usually is tapered on both sides; on rotary bits or cutter bits, on one side. The angle of taper, or cutting-edge angle, limits the depth of penetration in any particular rock but will vary with type of rock and its hardness. Because of the brittleness of tungsten-carbide inserts, a 90-deg angle usually is considered the minimum.

Cuttings removal is important in drill-bit design and performance. Larger exit areas and more air or water flow in percussion drilling help speed cuttings removal.

Percussion Bits

Detachable tungsten-carbide bits are used with pneumatic percussion units for drilling rocks too hard to economically penetrate with auger or rotary equipment. The smaller sizes are used with handheld percussion drills and stoppers for underground drilling and roofbolting. Medium-size bits are used on jumbo drifters for rock and tunnel work and wagon drills for stripping. The larger bits are used with larger crawler-mounted blasthole drills.

Tungsten carbide rock bits can be divided into three groups:

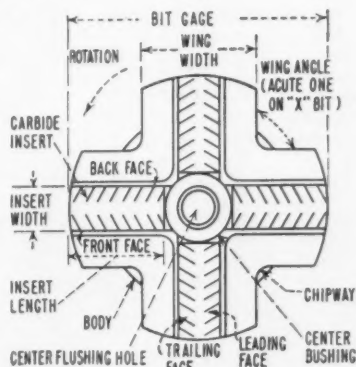
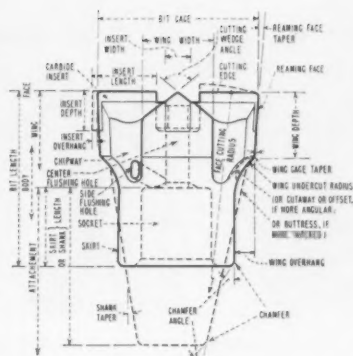
1. **Shoulder-drive bits**, mostly used in sizes up to 2½-in, generally with handheld drills and drifters with bores up to 3½ in or 4 in.

2. **Taper-socket bits** used primarily with airleg drills and stoppers, bores up to approximately 2½-in.

3. **Bottom-drive bits**, larger sizes from 2 to 6 in, the larger blasthole drilling machines in the 4- to 6-in class.

In a bottom-drive bit the force of the blow passes from the rod directly to the bottom of the bit socket.

They are available with the cross design in the smaller sizes and with the X design in the larger sizes to pre-



PERCUSSION-BIT TERMS are based on information from catalogs, articles and Government publications.

vent rifling and squaring of the hole.

The shoulder-drive bit takes the impact of the blow from the rod upset and sends the major force through the skirt to the cutting edges. Impact shock is absorbed by the heavy body of the bit which also provides large bearing surface for the tungsten-carbide inserts.

Getting More From Tungsten-Carbide Rock Bits

For the most efficient and most economical drilling with tungsten carbide rock bits, extreme care and proper procedure are very important in drilling; sharpening and reconditioning; and preparation of drill steel.

Knowing what to do will improve drilling results because of longer bit life, faster drilling, reduced drill upkeep and lower cost per foot of hole.

The following 14 suggestions show what and why of good rock drilling procedure:

1. Use new drill steel with new bits whenever possible to insure maximum bit and thread life.

2. Always tighten the bit on the shank with the special wrenches pro-

vided. Do not use pipe wrenches. Bits must be tight for maximum thread life.

3. Inspect threads on the rod and in the bit frequently. Worn rod threads might fail and result in bit loss. This is particularly important in soft rock where carbide inserts wear slowly and bits are used longer.

4. Always make sure that the rock bit is against the material being drilled before starting. Vibration, when the bit is not under pressure, will loosen the bit and cause thread wear, or will tend to loosen or chip carbide inserts when the bit is fed to the rock.

5. Do not keep the drill running after a full length of steel has been run out. Always keep pressure on the shank and bit when the drill is operating.

6. Do not drill with a dull bit. This practice reduces drilling speed, overworks the drill and could cause broken bits or shanks.

7. Always keep the chuck tight against the collar of the steel for better drilling speed and reduced chuck wear.

8. If carbide inserts are broken, chipped or lost in the hole, retrieve all particles of carbide with a magnet or scraper. Drilling on carbide particles left in the hole will fracture inserts.

9. Provide proper gage clearance for successive bits. Lack will pinch bits and fracture inserts.

10. Start the hole with the drill at half-throttle or less. Inserts will not be chipped or broken when they strike uneven surfaces.

11. Keep drill in alignment with the hole so that bits will not pinch and bind.

12. Keep the hole free of cuttings with adequate water or air.

13. Sharpen when cutting edges wear to ⅜ to ½ in flat. Greater wear fatigues inserts and drill rods, often results in breakage.

14. Don't drill with dull bits. It causes excessive torsional stresses on the rifle bar and the rifle nut in the drill, shortening life.

When to Sharpen Rock Bits

Under average conditions carbide insert rock bits should be sharpened when the flattened area on the cutting edge becomes ⅜ in wide or when the crown exceeds ⅜ in from the high point of the insert.

Cutter and Drill Bits

Overburden Bits

Company	Style or Catalog No.	Cutting Medium	Recommended Service	Bit Size (S), or Gage (G), in	Remarks
Chicago Pneumatic Tool Co.	ES-1C	Roller Cone	Soft Rock	5½-10½ (G)	Long, widely spaced teeth for deep penetration, large cuttings
	EM-1C	"	Medium-hard, highly abrasive rock	6¼-10½ (G)	T-beel on all three cones
	EH-3	"	Extremely hard, abrasive rock	5½-12¼ (G)	Complete set of webbed and reinforced gage teeth
	EH-4	"	Hardest, most abrasive formations	7½-9½ (G)	Individually formed teeth, heat-treated for maximum wear
	C-1	"	Reaming	7½-58 (G)	For enlarging pilot holes
Hughes Tool Co.—"Tri-Cone"	OSC-1G	"	Soft to medium hard rock with hard streaks	9½ (G)	Has extended teeth for deeper cut, more gauging-scraping action, fast penetration
	W7R-2	"	Hard, abrasive formations	22 plus (G)	Gage-cutting surface has greater area for hard-facing
Reed Roller Bit Co.	Cutters	"	Large-diameter holes		For drilling ventilation and man shafts
Smith Tool Co.	Y series	"	Soft to hard rock		Tooth structures and arrangements for all conditions
	DT, DT2G, DT2S, DT2L, L4, 4W1	"	Soft to very hard rock	5½-15 (G)	Tooth designs and arrangements for all conditions
Vard Mfg. Co.	V1, 2, 3, VH1	"	Soft to very hard rock	2½-up (G)	
	VC	"	Extremely hard rock		
Acker Drill Co., Inc.	V1, 2	Roller Cone	Soft to hard rock	3½-7½ (G)	
Security Industries, Inc.		"	Soft to hard rock		
Herb J. Hawthorne, Inc.—"Blue Demon"	SH	Carbide Insert	Shales, with few hard bands	5½-13 (G)	Step-type cutting blades, 3 or 4 per bit
	MP	"	Exploration	1½-3 (G)	Replaceable step-type cutting blades
	DB	"	Medium-weight drills	3-4¼ (G)	
	AC	"	Heavy-weight drills	4¼-6¾ (G)	
	Unlized	"	Clay and shale	4¼-4¾ (G)	
	Kelly	Steel, Carbide	Soft material	3-6¾ (G)	
Metallurgical Products Div., General Electric Co.—"Carboloy"	FB	Carbide Insert	Sandstone and limestone	½-½-3 (S)	Non-replaceable blades
Kennametal, Inc.	SD	"	Non-uniform, medium material	3¼-9 (G)	Pilot, RC or insert design
	UD	"	Hard slate & shale, limestone	6½, 9 (G)	Finger bit
	DG	"	Rock too soft for diamond bit	1½-3 (G)	Three-prong bit with core breaker or pilot bit in head
	XC	Carbide Insert			Three-prong non-corroding drag bit
	FS	"	Sandstone and limestone	½-½-2½-3½ (S)	Coring bit with 6 to 12 carbide teeth. Cuts cores 7/8" to 2½" in diameter
					Finger bit for medium-hard rock
Firth Sterling, Inc.—"Pirhlite"	F	"	Standard drill heads	½-½-2½-3 (S)	Finger bit for high-speed drilling
Long-Aldox Co.—"Cardox"	FB8	"	Auger head	½-½-2½-3½ (S)	Solid-shank finger bit
	FBTH8	"	"	"	Finger bit, top retainer-pin hole
	FBTH8	"	"	"	Finger bit, side retainer-pin hole
	FA10-1	"	"	"	Round-shank finger bit
	FAL10-1	"	"	"	"
	FD	"	Style M head	"	Special design with retainer-pin hole
	600	"	"	"	3-prong head with carbide core breaker
Metal Carbides Corp.—"Talde"	FB	"	Medium-hard rock	½-½-3 (S)	Finger bit
Central Mine Equipment Co.—"Coalmaster"		Steel, Hard-faced Steel	Auger head		Finger bits
Marathon Coal Bit Co., Inc.—"Border City"	AP-2				
Austin Powder Co.	7Y, 8Y, 8V	Hard-faced Steel	Auger head		
McLaughlin Mfg. Co.	KSD	Carbide Insert	Non-uniform medium rock	3½-9 (G)	Three-prong auger head for broken strata
The Salem Tool Co.	F	Hard-faced Steel	Medium-hard or friable rock	½-½-2½ (S)	Finger bit, hard-faced front side
	FB	"	Hard, highly abrasive rock	½-½-2½-3½ (S)	Finger bit, hard-faced front and back
	F1, 2, 3	Carbide Insert	Rugged conditions	½-½-2½-2½ (S)	Straight shank finger bit
	TFH	"	"	½, ½-½-2½ (S)	Taper shank finger bit
	KFS	"	"	½-½-3½ (S)	Straight shank finger bit
	S	"	All-purpose	8-36 (G)	
Brunner & Lay-Eastern, Inc.—"Holemaster"	J10, 20, 60	"	Hard rock	2½-6 (G)	Bottom-drive, detachable with cross, X or rose design for pneumatic drills
Joy Mfg. Co.					One-use, detachable
LeRoi Div., Westinghouse Air Brake Co.	CRD	Steel	Soft rock, wet conditions	1¼-2½ (G)	Replaceable cutting blades
Air Drill Co., Inc.	Drag	Carbide Insert, Hard-faced Steel	Softer rock	1½-5½ (G)	Available in 2-, 3- or 4-wing designs
	Fishtail	Steel	Shale, other soft rock	1½-3½ (G)	Finger bit
Vascoloy-Ramet Corp.—"Red Bits"	FA10-1	Carbide Insert	Variable conditions, with tapered shank heads	½-½-2½ (S)	
	FAL10-1	"	Severe conditions	"	Finger bit, slotted insert to minimize tip loss
	FB	"	Horizontal, vertical drilling	½-½-2½-3½ (S)	Finger bit, for all types machines
Mobile Drilling, Inc.	MD72T, 4T, DP	"	Soft rock	½-½-2½ (S)	Finger bits
	Percussion	Roller Cone Carbide Insert	Hard rock		

Possible Causes of Roller-Bit Wear and Breakage



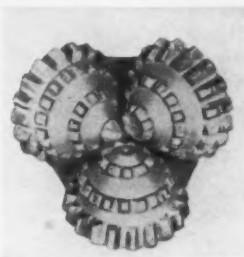
Excessive Bearing Wear

1. Excessive rotary speed
2. Excessive rotating time
3. Excessive weight on bit
4. Excessive sand in circulating fluid
5. Unstabilized drill collars
6. Improper bit type
7. Excessive gage wear



Excessive Broken Teeth

1. Improper bit type
2. Improper break-in procedure for new bit
3. Excessive weight on bit
4. Junk in hole



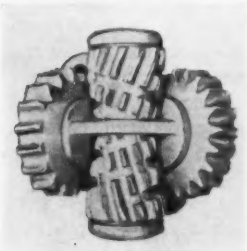
Unbalanced Tooth Wear

1. Improper bit type
2. Improper break-in procedure for new bit resulting in broken teeth which appear to be worn
3. Junk in hole resulting in broken teeth which appear to be worn



Excessive Tooth Wear

1. Excessive rotary speed
2. Improper bit type
3. Use of non-hard-faced bit



Cupping of Tooth Crests

1. Double hard-faced teeth
2. Insufficient weight on bit for adequate penetration
3. Improper rock for double hard-faced teeth



Bradding of Teeth

1. Excessive weight on dull bit
2. Rock too hard for bit type



Excessively Undergaged

1. Improper bit type
2. Excessive rotating time
3. Excessive rotary speed



Skidded Due to Balling

1. Excessive weight on bit
2. Improper bit type
3. Insufficient fluid circulation

When the driller notices a considerable reduction in the penetration rate he should change the bits.

Tips on Sharpening Rock Bits

1. Proper grinding equipment is important. For instance, one commercial grinder has three variable speeds, 8-in wheels, and attachments for grinding C-groove and O. D. clearance angles. Grinding wheels should be 60- or 80-grain silicon-carbide. Make sure that wheels turn at the proper surface speed. When wheel diameter is over 8 in the grinder should have an adjustable feed for proper regulation.

2. Some manufacturers recommend that water be flowed on the wheel and bit during grinding to prevent overheating bit inserts and reduce dust. Others recommend dry grinding so that the bit can be observed. Also more uniform tip temperatures are obtained. A bit overheated in grinding

should not be quenched in water because of the possibility of cracks in the brittle carbide insert.

3. Grind each bit wing so that the angle formed by the two faces of the insert is 105 deg. Flatter or steep angles could cause premature wear or insert failure.

4. Leave a $\frac{1}{32}$ -in flat edge on the insert face. Knife-like edges may crack at the first blow.

5. Chamfer the outside edges of the insert to prevent cracking or chipping at this point.

6. Check gage and grind the side of the bit as required to place the high point not more than $\frac{3}{32}$ in down the side.

7. Check the thread of the bit. A bright ring at the bottom of the threaded hole indicates that the steel is "bottoming" because the thread on it is too long. Defective steels should be taken out of service and reconditioned.

8. Gage the bits and sort according

to size. Mount in racks, using as many racks as the driller has steel changes to make. By starting a hole with the largest bit and using progressively smaller bits with each steel change, binding and possible bit damage are prevented.

Rotary Overburden Bits

Few products demand more rigid metallurgical specifications and control than roller-cone rock bits. This involves a selected high-nickel, molybdenum steel, designated 4815, for cones and steels for other bit components specified to closer limits than for commercial use. For example, a special tough steel is used by all roller-bit manufacturers for ball and roller bearings. This steel has high resistance to chipping or breaking under shock loads.

Tungsten - carbide hardsurfacing

[illegible]

When rock tends to pack between teeth, tooth penetration decreases, resulting in a reduction in the penetration rate or ballin of the bit. Most

of the packing takes place in the cross-section gage cutters and in the outer rows of teeth on the cone.

To prevent packing there must be adequate space between teeth. But use of long, widely spaced teeth on all the cones or cutter may cause the teeth to track and thus generate a gear-tooth pattern or ridges on the rock. Bit penetration decreases. To break up the ridge pattern at least one of the cones or cutters must carry more closely spaced teeth. Since this might also result in packing, various tooth-deletion patterns are employed to develop adequate spacing while retaining the desired cutting characteristics.

Tungsten carbide applied to the gage and teeth surfaces prevents rapid loss of bit gage or fast tooth dulling. Hard-surfacing materials are applied to the gage surfaces of all roller bits but not to all teeth.

The characteristics of a rock determine the degree to which rock-bit teeth must be hard-faced. It may range from omission on one face to application on all four surfaces of the teeth. However, at least one side of each tooth is hard-faced over its entire area. By applying the wear-resistant material to one side only, the softer carburized surface on the other side wears away faster for a self-sharpening effect.

In some instances additional tooth life is gained by facing the opposite side of a tooth for a short distance from the crest toward the tooth root. This reduces initial rate of wear and the crest width does not become excessive until the tooth is worn beyond the faced surface.

Bits that are hard-surfaced full length on all four faces of the teeth usually are used in soft formations containing an appreciable percentage of abrasive materials. Because any self-sharpening effect is retarded by facing, these bits should be used in formations that can be penetrated by the teeth if they become flat or blunt.

Bit manufacturers make a wide range of roller bits for all rock conditions. Since many rock formations are not homogeneous there are wide variations in drillability. One formation may be soft and homogeneous and require a specific type of bit. But if hard streaks run through it, drillability of the harder streak may govern bit choice.

Types of Roller Bits

Because the softest rocks are drilled best with maximum gouging-scraping action the rolling characteristic of the cones must be that which varies greatest from a true roll. The bit therefore usually incorporates the smallest journal angle, largest offset and greatest variation in cone-profile angles. Tooth depth is a maximum and the included angle a minimum. Widely spaced teeth and ample tooth deletions are provided for self cleaning and resistance to packing. Tungsten carbide is applied to the outer end, one full face and to the tip of the opposing face of each tooth for greater wear resistance. To get maximum resistance in abrasive formations facing sometimes is applied to both sides of the teeth.

A typical bit for use in soft to medium rock with harder streaks usually has the same journal angle and offset as a bit for the softest rock. Maximum gouging-scraping action is maintained but teeth are more closely spaced and slightly shallower. Sufficient tooth deletions are also provided for proper self-cleaning. Increased gage protection provides greater resistance to gage wear in the harder streaks. To maintain maximum self-sharpening needed for the harder streaks tungsten carbide is not applied to the opposing face.

Because medium to medium-hard rock is best drilled with a combination of gouging-scraping and chipping-crushing actions a maximum journal angle and medium offset are used. More closely spaced, heavier and shallower teeth withstand the heavier impact loads. Tooth deletions reduce the tendency of the teeth to pack and to permit increased penetration when there are no under-gage problems. Facing is applied to one full face and to the outer end of each tooth only to promote greater self sharpening.

A hard, abrasive formation requires a bit that produces an efficient chipping-crushing action. Such a bit therefore usually incorporates maximum journal angle, no offset and minimum variation in the cone-profile angles. Because of the abrasiveness and the chipping action of the bit cone, the teeth are closely spaced to obtain maximum wearing qualities.

The included angle of the teeth is the largest to withstand the high im-

pact loading. Tooth depth is less than with the other types. Facing of the teeth is omitted to reduce chipping and fracturing of the case-hardened surfaces. Bearing capacity also is greater than that of the soft- and medium-formation bits.

Diamond Core-Drilling Bits

Diamond drill bits cut through rock with a gouging, abrasive action rather than with a chipping, fracturing or shearing action. They are available in coring and non-coring types for drilling holes with diameters ranging from 1½ to 7¼ in.

A diamond bit consists of three parts: the body or blank; the matrix; and the diamonds. Diamonds are set in the matrix which is securely connected to the body.

The matrix can be made of various alloys for various rock hardnesses.

Diamond bits are available with various grades of diamond in various stone sizes. For average drilling one manufacturer specifies stone size at 20 to 30 per carat or 30 to 40 per carat. For very hard rock drilling size range may be 60 to 80 per carat. In drilling coal large stone bortz or Congo diamonds are generally used, 10 to 14 or 14 to 20 per carat.

In addition to the large variety of bits with surface-set diamonds, manufacturers make diamond-impregnated bits with an even distribution of small uniformly sized particles throughout the matrix. They are especially suitable for drilling through very hard, broken or extremely abrasive ground, where diamond loss from surface-set bits may be excessive.

If an impregnated bit is used to drill relatively unabradable material, it may be necessary to periodically sand blast the cutting area to expose new cutting surfaces.

Impregnated coring bits are most effective when used at high drilling speeds and relatively light pressure. Under these conditions they give excellent results until completely consumed. They cannot be reset and have no salvage value. Although the first cost may be more than for surface-set bits of corresponding size and type, their use may prove to be more economical in the long run.

Oriented Bits—About 10 yr ago a new concept in diamond bit design was developed. Drilling diamonds are oriented in the matrix in their hard

Cutter and Drill Bits

Cutter Bits

*W = width T = thickness G = gage L = length

Company	Style, or Cat. No.	Tip Design	Recommended Service	*Dimensions, In W T G L	Rake Angle, Deg	Remarks
Metallurgical Products General Electric Co.— "Carboloy"	CCS-2, CC-2	Enclosed-cylinder	Severe conditions	1 1/2 1 1/2 3/4 3 1/2	+ 5	All cutting machines, continuous miners
	CC-9	"	Severe conditions, continuous miners	" 1 1/2 "	"	75% greater shank cross section at gage line
	CC-11	"	Severe conditions	" 1 1/2 "	"	Set-screw notch in shank
	CC-T	"	Trimmer bit	" 1 1/2 2 1/2 "	"	For rotating continuous miner arms
	CC-12 A1	"	Continuous miners	1 1/2 5/8 1 1/2 3 1/2	"	Held by elastic locking mechanism
	CCA-1	Full-radius	Coal recovery augers, cutting machines, continuous miners	1 1/2 1 1/2 3/4 "	"	Protects against tool side wear, reduces dust
	CCH-6	"	Boring-type continuous miners	" " " "	"	Full-width shoulder in shank, hole in shank
	CC-8	"	Cutters, continuous miners, tough conditions	" " " "	-10	Negative rake angle makes possible greater edge support
	CC-12	"	Continuous miners	1 1/2 5/8 " 3 1/2 + 5	"	Held by elastic locking mechanism
	CCS-1	Slotted-chisel-point	Light to medium duty	1 1/2 1 1/2 4 +15	"	Narrow cutting edge reduces drag
	CC-3	"	Most difficult conditions	" " " 3 1/2 "	"	Thicker, stronger cutting tip, with extra steel support
	CC-6	"	Shortwall, universal cutters, highwall augers	" " " "	"	
	CC-12-8, CC-14, CC-14-8, CC-14-A1	"	Continuous miners	" " " "	"	
Kennametal, Inc.	U4	Flat-triangular	Cutting machines, ripper-type miners, easy to moderate conditions	1 1/2 1 1/2 3/4 3 1/2	+15	Small nose radius, and 15 deg rake angle for fast cutting action
	U10S	Narrow-slotted	Coal, few hard impurities	" " " "	"	Produces coarse cuttings
	U10A	Disc	Heavy partings, sulphur balls	" " " "	+10	Less expensive, as used for similar conditions instead of throw-away bit
	U11A U7	Full-radius	Highwall augers, where full cutting edge is needed	" " " 1 1/2 1 1/2 3 1/2 +10	"	Rugged enough to operate in seams with some impurities
	U8	"	Miners and cutters, severe conditions	" " " 1 1/2 1 1/2 3 1/2 + 5	"	Withstands impact
	U7RA	Enclosed-cylinder	"	" " " 1 1/2 " " " "	"	Withstands impact, shank has enlarged
	U7RAB	"	"	" " " 1 1/2 " " " "	"	Withstands impact
	U8RA	"	"	" " " 1 1/2 1 1/2 3 1/2 "	"	Withstands impact
Firth Sterling, Inc.	CD-14, C-14	Enclosed-cylinder	"	1 1/2 1 1/2 3/4 "	"	No set-screw needed, held by neoprene seal. C-14 has slotted insert
Long-Mindox Co.— "Cardox"	CA-1	Full-radius	Soft or moderate conditions	1 1/2 1 1/2 "	"	Produces coarse cuttings
	CA-2	"	"	" 1 1/2 "	"	Has pin hole in shank
	CAJ-1	"	"	" 1 1/2 "	"	"
	CAJ-2	"	"	" 1 1/2 "	"	"
	M20	Slotted	Soft, medium coal, few hard impurities	" " 1 1/2 "	"	Produces coarse cuttings
	M22 K	"	Universal and shortwall cutters where cutting is easy	" " 1 1/2 "	"	Available with pin hole
	K-1	"	Continuous miners in severe conditions	" " 1 1/2 "	"	"
	PB-8	Disc	Continuous miners in severe conditions	" " 1 1/2 "	"	"
	CHD13-2	"	Severe conditions	" " 1 1/2 "	"	Special heavy-duty shank
	CM	Recessed	Ripper-type miners, impurities	" " 1 1/2 "	"	"
	CMJ	Slotted	Continuous miners	" " " "	"	Has pin hole in shank
	B-3	"	"	" " " "	"	"
	L-1	"	"	" " " "	"	"
	M12	"	"	" " " "	"	"
	M12-N	"	"	" " " "	"	"
	M12-B	Recessed	Continuous miners, severe service	" " " "	"	Has set-screw notch
Salem Tool Co.	KU-7	Flat-chisel	For KUD auger head	" " " "	"	Has lighter shank
	FCIL	Slotted-chisel	For auger heads	" " 1 1/2 3 1/2	"	For harder drilling
	FC-7	"	"	" " 1 1/2 4	"	Insert is 1/4-in thick
	FC-8M	"	"	" " 1 1/2 3 1/2	"	Insert is 1/4-in thick
	FC-8S	"	Barred head augers, coal recovery	" " " "	"	"
	BR-3	Enclosed-cylinder	Continuous miners	1 1/2 1 1/2 "	"	Held in place with neoprene cylinder, quick change bit for Cinn block
Allegheny Ludlum Steel Co.— "Carnet"	B-3, RB-3, RBR-3	Slotted-full-radius	"	" " " "	"	"
	JR, J	Enclosed-cyl.	All conditions	1 1/2 " 3 1/2 + 5	"	Set-screw seat design permits full-length gaging
	HNR	"	Miners, universal and shortwall cutters	" " 1 1/2 3 1/2 "	"	Has set-screw notch
	JN-3	Slotted-full-radius	Continuous miners, all conditions	" " 1 1/2 3 1/2 "	"	Extra heavy carbide support, set screw notch available with 1/4-in hole
	IN-4 HJN	"	Wilcox miners, coal augers	" " 1 1/2 3 1/2 +10 +15	"	Has gage stop

U7R	Recessed	Ripper-type miners, impurities	"	"	1 1/4	3%	"	Design provides additional mechanical hold on insert	G-1, 2, 3, 5	Slotted-chisel-point	Continuous miners, heavy-duty under-cutters	"	1 1/4	3 1/2	- 5	Straight shank with gage stop, hooked recess on top of shank for easy removal, -5 to +10 deg rake angle
U7R-10	"	"	"	"	"	"	"	"	GN-1, 3, 5	Same as G-1, 3, 5 but with notched shank						
U7RB	"	"	"	"	1 1/4	3%	"	"	GR-1, 3, 5	Same as G-1, 3, 5 but with enclosed carbide cylinder						
U8R-10	"	"	"	"	"	"	"	"	JC	Slotted-full-radius	For Colmol and boring-type miners	1 1/4	3 1/2	+10		Pin hole, designed for maximum side wear, gage-stop collar adds strength
U3RA	"	Continuous miners	"	"	"	1 1/4	3%	Throat of shank enlarged for greater strength	GVR	Enclosed-cylinder	Severest conditions	"	1 1/4	"	+ 5	Extra strength in shank behind shoulder, weldable with pin hole, for Joy GV-6111 chain
J2, U7P	Flat-triangular	Rotary-type miners, hard cutting	"	"	"	"	"	Has 1/4-in pin hole, full-width cutting edge, wide clearance	GV KN	Same as GVR except with capped insert	Continuous miners, cutters, easy to medium conditions	1 1/4	3 1/2	+10		Designed to produce coarse coal, has setscrew notch
U7TV	Full-radius	Rotary miners, highwall augers	"	"	"	"	"	Tapered and beveled shank eliminates bit wobble, pin hole in shank	HN-1, HN-3, HN-5	Slotted-triangular	Heavy duty cutters, some continuous miners, light to medium conditions	"	1 1/4	"	- 5	Has setscrew notch, -5 to +15 deg rake angle
U9	Full-radius	Hard cutting	1 1/4	1 1/4	3%	3%	+10	For Bowditch chain blocks	A-4	Slotted-chisel	Average conditions, some impurities	"	"	4	+10	Straight shank, carbide is 1/4-in thick, rounded edge
U9R	Recessed	"	"	"	1 1/4	3%	"	"	C-5	Slotted-chisel	Cutters, some continuous miners, impurities	"	"	"	+15	Straight shank, 1/4-in in carbide, flat cutting edge
U6R	"	"	1 1/4	1 1/4	3%	3%	+ 5	For Cincinnati chain blocks	D-5	"	Abrasive cutting	"	"	"	"	Straight shank, 1/4-in in carbide, high wear resistance
U17	Enclosed-cylinders, Full-radius, Reversed	Heavy duty	1 1/4	1 1/4	3%	3%	"	Gage shoulder at front, uses steel pin in neoprene cylinder as keeper	E	"	Goodman boring miner	5/8	4 1/4	+ 5	"	Strong tapered shank, resists bit breakage
C-1-L	Slotted-chisel	Light duty	1	1 1/4	3%	3%	"	1/4-in carbide tip has 1/4-in radius	CC	"	Medium cutting, continuous miners and shortwall machines	1 1/4	1 1/4	4	+15	Milled shank with gage stop, yields coarse coal
C-4-L	"	"	"	"	1 1/4	4	"	"	L-5	"	For Bowditch ML chain	"	3 1/4	"	"	"
C-1-H	"	Medium duty	"	"	1 1/4	3%	"	1/4-in carbide tip has 1/4-in radius	N-5	"	Clearance bit on continuous miners	1 1/4	3 1/4	"	"	Also adaptable for shortwall cutters
C-4-H	"	"	"	"	1 1/4	4	"	"	O-4	"	Drum-head miners, severe conditions	1 1/4	5	+10	"	"
C-6-S	"	For Bowditch chain	1 1/4	1 1/4	3%	3%	"	1/4-in carbide tip has 1/4-in radius	GJ-5	"	Coal-recovery augers	"	"	+15	"	Has special clearance angles
C-7-S	"	General purpose, heavy duty	1	1 1/4	3%	3%	"	1/4-in carbide tip has 1/4-in radius	NP-5 BF	"	Shortwall cutters	1 1/4	"	"	"	Special angle on shoulders for easy removal
C-8-S	"	"	"	"	1 1/4	3%	"	"	NP-6 BF	Slotted	Continuous miners	"	"	"	"	Increased clearance for fast cutting
C-7-S-4	"	General purpose, extra heavy duty	"	"	1 1/4	3%	"	1/4-in carbide tip has 1/4-in radius	MB-10	Slotted-chisel-point	Light and medium duty	1 1/4	"	4	Pos.	Has thick tip and shank
CA-7	Flat-chisel	Coal recovery auger	"	"	"	4	"	"	MB-20	"	Toughest conditions	"	"	"	"	"
C-8	"	"	"	"	1 1/4	3%	"	"	MB-30	Enclosed-cylinder	All cutting machines and continuous miners, rugged conditions	"	"	"	"	"
C-7-M	Slotted-chisel	Extra heavy duty	"	"	1 1/4	4	"	"								
C-8-M	"	Coal recovery auger	"	"	1 1/4	3%	"	"								
C-9	Slotted	Economy tool for continuous miners	"	"	"	3%	"	1/4-in carbide tip has 1/4-in radius								
C-9-G	"	Clearance bit on Goodman miner	"	"	"	2 1/4	"	"								
CMC	Full-radius	Heavy duty cutting, impurities	"	"	1 1/4	3%	"	1/4-in carbide tip with 1/4-in radius	Newcomer Products, Inc.							
CM-7	Slotted	Continuous miners, medium to heavy duty	"	"	"	4 1/4	"	Available with tapered shank	Metal Carbides Corp.—"Tallie"							
CD-7	Enclosed-cylinder	Continuous miners, medium to heavy cutting	"	"	"	4	"	Withstands heavy impact								
CMJ, CMJ-7	"	For Joy GV-6111 chain	"	"	"	"	"	CMJ-7 has full-radius insert								
CT-7	Flat-chisel	Medium to heavy cutting	"	"	"	4 1/4	"	Tapered shank								

(Continued on next page)

(Continued on next page)

Cutter and Drill Bits

Cutter Bits (Continued)

*W = width, T = thickness, G = gage, L = length

Company	Style, or Cat. No.	Tip Design	Recommended Service	W	T	G	L	Rake Angle, Deg	Remarks
Austin Powder Co.	MB-40	"	Trimmer bit, Goodman continuous miner	"	"	2 3/4	"	"	Shank design is circular taper, set screw, roll pins or rubber retainers
	MB-50	Full-radius	Coal recovery augers, cutters, continuous miners	"	"	1 3/4	3 3/4	"	Throwaway type, very good shock resistance
	MB-60	"	Rotating-arm continuous miners employing full radius bit	"	"	"	"	+15	Throwaway type, good shock resistance
	MB-70	"	Where drag is problem	"	"	1 1/2	3 3/4	Pos.	Reg. C-11-S
Cutter Bit Service Co.— "Cutrite"	MB-80	"	Severe conditions	"	"	1 3/4	3 3/4	Neg.	Reg. C-11-S
	6020, 60	Hard-faced, Pickpoint	Moderate conditions	"	"	"	4	Pos.	Reg. C-11-R
	S-28, S-210	Chisel-point	Difficult cutting	"	"	"	"	"	Reg. C-11-S
	S-38, S-310	"	"	"	"	"	"	"	Reg. C-11-S
	F-28, F-310	Flat-triangular	Medium conditions	"	"	"	"	"	Reg. C-11-S
	F-38, F-310	"	"	"	"	"	"	"	Reg. C-11-S
	H-38, H-310	Chisel-point	Continuous miners, severe conditions	"	"	1 3/4	3 3/4	"	Reg. C-11-S
	H-48, H-410	"	"	"	"	"	"	"	Reg. C-11-S
	AP-10D	Enclosed-cylinder	Continuous miners, cutters, wall and universal cutters	"	"	"	"	"	Reg. C-11-S
	AP-10R	"	"	"	"	"	"	"	Reg. C-11-S
Marathon Coal Bit Co., Inc.	AP-20	Recessed	Continuous miners	"	"	"	"	"	Reg. C-11-S
	AP-20D	Enclosed-cylinder	"	"	"	"	"	"	Reg. C-11-S
	AP-20R	Slotted-full-radius	"	"	"	"	"	"	Reg. C-11-S
	Throw-away	"	"	"	"	"	"	"	Reg. C-11-S
The Bowditch Co.	1-1	Alloy-steel	Where cutting is not severe	"	"	"	"	"	Reg. C-11-S
	1-2	"	Severe conditions	"	"	"	"	"	Reg. C-11-S
	1-6	"	Longwall work	"	"	"	"	"	Reg. C-11-S
	1-11	"	Where drag is problem	"	"	"	"	"	Reg. C-11-S

119

Roof-Bolting and Rock Bits

For rotary drills unless noted. Carbide-insert type unless noted

Cutter and Drill Bits

Company	Style or Catalog No.	Recommended Service (B) Bolting; (R) Rock	Shank Size, In	Shank Length, In	Bit Gage, In	Remarks
Metallurgical Products Development Co.—"Carboloy"	PTV	B Varying hard conditions	1/4 Sq	1 1/4	1 3/8-1 1/2	Spade-type, large throat, quick cuttings removal
	APT	B Soft to hard roof	"	"	1 1/8	Two-prong, drills fast
	ADP	B Hard roof	"	"	1 3/8-1 1/2	Two-prong, for more rugged duty
Kenametal, Inc.	FDC	B Varying hard conditions	"	1 1/4	1 3/8-1 1/2	Spade-type, large throat, quick cuttings removal
	FDL	B Soft to normal roof	"	"	1 3/8-1 1/2	Notched design for faster penetration
	FDH	B R Starter bit, harder rock	"	2	1 7/8	For larger holes
	FDDC	B R	3/8 Sq	2 1/4	1 3/8	"
	FDDH	B R	"	"	1 7/8-2 1/4	Spade-type for larger holes
Firth Sterling, Inc.—"Firthite"	RDF	B Difficult roof drilling	3/8 Sq	1 1/4	1 3/8-1 1/2	Spade-type, for denser abrasive rocks
	RDH	B Very dense, abrasive rock	"	"	1 3/8-1 1/2	Spade-type, sharper apex angle and generous clearance, faster cutting
	RDS	B Medium to hard rock	"	"	1 3/8-1 1/2	Slotted or center-relieved faster drilling
	D	B Clay, shale, bone	1/2, 3/8 Sq	2-3	1 3/8-3 1/4	Two-prong, drills fast, quick cuttings removal
	DV	R High-speed hand-held drills	"	2 1/4, 3	1 3/8-2	Two-prong, V-shaped, fast penetration
Long-Airdux Co.—"Cardox"	DR	B Severe conditions	"	"	1 3/8-1 1/2	Spade-type, for harder, abrasive rocks
	DRS	B Medium to hard rock	"	"	1 3/8-1 1/2	Slotted, for softer rocks
Alleghevy Luminum Steel Corp.—"Carbet"	TT	B R Hard, abrasive roof rock	"	"	1 3/8-1 1/2	Spade-type, withstands high thrust, fast speeds
	T	B R Friable roof rock	"	"	1 3/8-1 1/2	Two-prong, drills fast
	SS	B	"	"	1 3/8-1 1/2	"
	S	B	"	"	1 3/8-1 1/2	"
	W	R Friable material	1/2, 3/8 Sq	1 1/2 Hex	1 3/8-3	Two-prong, V-shaped
	VL	R Shale	"	"	1 3/8-2	Two-prong, short, stubby
Newcomer Products, Inc.	NP, 10KS, 11KS	B Harder rock	1/2 Sq	"	1 3/8-1 1/2	Spade-type, for harder rock
	NP, 10K, 11K	B Softer rock	"	"	1 3/8-1 1/2	two-prong
Metal Carbides Corp.—"Tallite"	RS	B Severe conditions	"	1 1/4	1 3/8-1 1/2	Spade-type, for abrasive rock
	RA	B Softer roof	"	"	1 3/8	Two-prong, for drilling shale, bone, coal
	DH	R Handheld drills	"	"	1 3/8-3	two-prong, V-shaped
	DM	R Self propelled, post-mounted drills	"	"	1 3/8-3 1/4	Two-prong, wide throat, extra clearance
Austin Powder Co.	RD	B	"	"	1 3/8-3 1/2	"
LeRol Div., Westinghouse Air Brake Co.	CRD	B R Percussion drills, soft rock, wet conditions	"	"	1 1/4-2 1/4	Friction fit to drill steel. Line-use steel bit featuring one-hole, five-hole dust-collector and Vac-Ne-Matic designs
Ingersoll-Rand Co.—"Carbet"	KBB	B R Percussion drills, hard rock	"	"	1 3/8-1 1/2	"
J. H. Fletcher & Co.—"Key Bit"	KBB	B Soft to hard rock	"	"	1 3/8-1 1/2	Flat, key type with internal through-steel dust collection system
Vascoloy-Ramet Corp.	DR	B General purpose	1/2, 3/8 Sq	1 1/4	1 3/8-1 1/2	Spade-type, for abrasive rock
	DRA	B Medium-hard drilling	3/8 Sq	"	1 3/8-1 1/2	Spade-type, sharper apex angle, faster cutting
	DRS	B Soft-shaly rock	"	"	"	Two-prong, fast drilling in soft rock
	PDR	B Hard rock, pneumatic drills	"	"	1 3/8-1 1/2	Cuttings withdrawn through bit, taper socket for long life
	AM	R Dry drilling, softer rock	1 1/8, 1 1/4 Hex Threaded	"	2 1/4-3 1/2	Two-prong, side wear strip for long life
	SP	R Wet drilling	"	"	1 3/8-3	Spade-type, E and A threads, with water hole
	SPS	R	"	"	1 3/8	Notched, E thread, with water hole
		R Hard rock, percussion drills	"	"	1 3/8-5	Cross or X style, various threads, bottom drive
		R	"	"	1 3/8-4	Cross or X style, various threads, shoulder drive
		R	"	"	1 3/8-2 1/4	Fits 6- and 12-deg tapered rods, taper socket
	FBH-1, 2	R Auger heads	3/4, 1 1/2, 3 1/4, 3 1/2	9/16, 1 1/8	"	Finger bits, with top or side hole
	FD-1	R With special holder	"	"	"	Finger bit, on head to replace 2 1/2 in auger bits
Joy Mfg. Co.—"Copperhead"		B, R With percussion drills, rock too hard for rotary drilling	"	"	1 1/4-3	Cross design cutting face, shoulder drive
		B, R	"	"	1 1/4-1 1/2	Requires shim between bit and steel, taper socket
		R	"	"	1 1/2-5	Cross design cutting face for sizes up to 3 in, X design for larger holes, bottom drive
Brunner & Lay-Eastern, Inc.	B&L	B, R Percussion drills, soft rock, wet conditions	"	"	1 1/4-2 1/2	Friction fit to drill stem. One-use bit
LeRol Div., Westinghouse Air Brake Co.	CRD	B, R For Class A percussion connections, drill-rod connections, drill-rod connections, percussion drills	"	"	1 1/4-1 1/2	Used for destruction, five-hole vacuum type has shallow carbide inserts, taper connection
	TCVA	B, R For Class A percussion connections, drill-rod connections, drill-rod connections, percussion drills	"	"	1 1/4-1 1/2	Low cost, used to destruction, pilot design, five-hole steel bit, vacuum type
	TCVB	B, R For Class B percussion connections, drill-rod connections, percussion drills	"	"	1 1/4-1 1/2	"
	SLVA	B, R For Class A drill-rod connections, percussion drills	"	"	1 1/4-1 1/2	"
	SLVB	B, R For Class B drill-rod connections, percussion drills	"	"	1 1/4-1 1/2	"
Ingersoll-Rand Co.—"Carbet"		B, R Percussion drills, hard rock	"	"	1 1/4-1 1/2	"
J. H. Fletcher & Co.—"Key Bit"		B Soft to hard rock	"	"	1 1/4-1 1/2	"

vector direction and therefore do not wear as quickly as random-set diamonds. Field results showed that bit cost per foot of hole could be reduced an average of 39c in both solid and broken formations ranging in hardness from shales to gneiss.

Non-Coring Diamond Bits—These have proven themselves useful in drilling grout holes, drainage holes and power boreholes where no core is desired. A noncoring bit makes a smooth round hole and can be obtained in concave, pilot and taper designs.

A concave bit is especially suitable for drilling comparatively soft formations. Designed originally for drilling blastholes in very hard formations, the pilot bit has proved its superiority for drilling blastholes in very hard formations where other types of bits have a tendency to drift. The taper-type diamond bit was developed to meet the need for a fast-cutting bit for drilling blastholes in very hard rock.

Cutter Bits

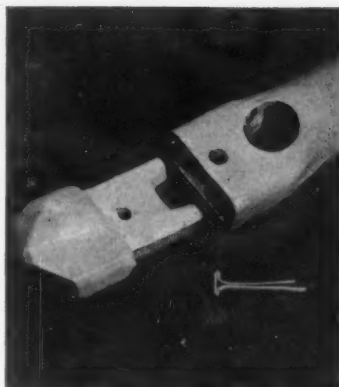
To meet the needs of the wide range of mining conditions as well as the variety of designs of shortwall and universal cutters, continuous miners and coal-recovery augers, manufacturers have available a wide variety of bits. Although the greatest emphasis is on hard-faced or carbide-insert bits, steel pick-point bits are still available.

Pick-point bits are made from special steel that is tough and will hold a keen cutting edge. In sharpening or shaping a pick-point one manufacturer recommends forging at 1,650 F and hardening at 1,375 to 1,450 F. Drawing temper should begin at 450 F and be increased until the best bit temper is obtained for a particular cutting job.

Manufacturers of cemented-carbide cutter bits not only provide a wide assortment of tip styles and shank designs but also usually offer three different grades of carbide. This large assortment enables coal operators to choose a bit that not only has the desired cutting qualities but also a shank designed for a specific type of machine.

Carbide Tip Styles

Carbide cutter-bit tip styles in-



LATEST ENTRY in roof-bolting features flat key shank for use with through-steel dust collector systems.

clude disc, flat triangular, slotted, chisel point, enclosed cylinder, full radius and recessed or channel.

Shank styles include straight; straight with gage stop; notched with gage stop; straight with gage stop and pin hole; reinforced throat with gage stop; tapered; and special designs for certain chain blocks, coal-recovery augers and continuous miners.

Flat Triangular Tip—Used in easy to moderate cutting. Narrow cutting edge and 15 deg rake angle. Flat triangular insert has small nose radius, produces fast cutting action and coarse cuttings with low power draw. Suitable for shortwall and universal cutters, ripper-type continuous miners.

Disc Tip—Disc-shaped insert 5-deg front clearance is brazed in milled recess in nose of bit. Used as a substitute bit on continuous miners when heavy partings or nests of sulphur balls are encountered. Less expensive. Recommended for marginal conditions where steel bits or hard-faced steel bits are used.

Enclosed-Cylinder Tip—Especially suited for ripper-type continuous miners and conventional cutting machines in severe conditions. Design takes full advantage of cemented carbide's exceptionally high compressive strength. Greater protection against tip loss because tip is double held by braze and mechanical means.

Full-Radius Tip—Features a full-width cemented-carbide insert where a full cutting edge is required for added clearance. Especially suitable for highwall augers and conventional cutters where coal cores. Rugged enough to operate in seams containing some impurities or partings.

Recessed or Channel Tip—Carbide insert is brazed in channel for extra mechanical support. Well suited for use in ripper-type continuous miners where impurities are frequently encountered.

Slotted Tip—Tip has three-sided braze (top, end and bottom) to resist side pressure and tip loss when cutting in hard materials.

Chisel-Point Tip—Narrow, tapered cutting edge reduces die wear and excessive drag, keeps power consumption low. Chisel nose reduces dust generation, produces coarse coal. Recommended for easy to medium cutting, all types of equipment.

Throwaway Cutter Bits

Throwaway-type cutter bits are available in alloy steel, plain or tipped with either boron or tungsten carbide. Both styles are double pointed and are heat treated for greater strength, toughness and long life. Heat treatment may be varied to meet cutting conditions.

For extremely hard cutting in coal containing maximum impurities a bit with very good shock resistance and slightly less hard than a file is recommended. As the percentage of impurities decreases, bit shock resistance decreases and hardness increases. A carbide-tipped throwaway bit is recommended for either average cutting conditions or uniformly abrasive cutting in material with a minimum of impurities. Boron-tipped bits are designed either for medium cutting conditions or for severe conditions, such as, cutting iron pyrites or rock.

Coal and Roof Drill Bits

Carbide-tipped coal drill bits come in prong-type styles designed to drill straight holes and feed cuttings to the auger fast. Rake and clearance angles are designed for fast penetration, and tip and prong to withstand abuse normally encountered in coal drilling. In some designs the carbide inserts are longer on the gage side for longer life and more regrinds.

Bits for handheld drills generally have V-shaped prongs and carbide inserts for fast penetration with less feed pressure. Maximum relief and clearance angles speed cutting action.

Bits for post-mounted or self-pro-

Coal Drilling Bits

Company	Style or Catalog No.	Cutting Edge	Recommended Service	Size, In	Shank Lgth, In	Bit Gage, In	Remarks
Metallurgical Products Dept., General Electric Co.—"Carboloy"	AD	Carbide	Post or machine-mounted equipment, coring conditions	$\frac{1}{2}$, $\frac{3}{8}$ Sq, $\frac{1}{16}$, $1\frac{1}{2}$ Hex	$\frac{1}{2}$, $1\frac{1}{2}$	$1\frac{1}{2}$, 3	Two-prong, full clearance angles for fast free-cutting action
Kennametal, Inc.	ADN	"	Handheld drills	$\frac{1}{2}$, $\frac{3}{8}$ Sq, $\frac{1}{16}$ Hex	$1\frac{1}{2}$, $\frac{3}{4}$	$1\frac{1}{2}$, 3	Two-prong, V-design for fast penetration
	DD	"	Widely varying conditions	$\frac{1}{2}$, $\frac{3}{8}$ Sq, $\frac{1}{16}$ Hex	2 , $2\frac{1}{2}$	$1\frac{1}{2}$, $2\frac{1}{2}$	Two-prong, rake and clearance angles provide fast penetrations
	DB	"	Powerful mounted drills	$1\frac{1}{2}$ Hex	$2\frac{1}{2}$	$2\frac{1}{2}$, 3	For larger holes. Tip mounting design similar to Style D
	DL	"	Handheld rotary drills	$\frac{1}{2}$ Sq	2	$1\frac{1}{2}$, $1\frac{1}{2}$	High-speed drilling in nonferrous metal, V-prong design
Firth Sterling, Inc.—"Firthite"	D	"	General service	$\frac{1}{2}$, $\frac{3}{8}$ Sq, $\frac{1}{16}$, $1\frac{1}{2}$ Hex	$2\frac{1}{2}$	$1\frac{1}{2}$, $3\frac{1}{2}$	Two-prong, fast, free cuttings removal, with minimum drag
	DV	"	High-speed handheld drills	$\frac{1}{2}$, $\frac{3}{8}$ Sq	2 , $2\frac{1}{2}$	$1\frac{1}{2}$, 2	Two-prong, fast penetration
Long-Airco Co.—"Cardox"	D	"	"	$\frac{1}{2}$, $\frac{3}{8}$ Sq, $\frac{1}{16}$ Hex	$1\frac{1}{2}$, 3	$1\frac{1}{2}$, 3	Two-prong
	DL	"	"	$\frac{1}{2}$, $\frac{3}{8}$ Sq, $\frac{1}{16}$, $1\frac{1}{2}$ Hex	$1\frac{1}{2}$, 3	$1\frac{1}{2}$, 3	"
	DB	"	"	$\frac{1}{2}$, $\frac{3}{8}$ Sq, $\frac{1}{16}$, $1\frac{1}{2}$ Hex	$1\frac{1}{2}$, 3	$1\frac{1}{2}$, 3	"
	FB	"	"	$\frac{1}{2}$, $\frac{3}{8}$ Sq, $\frac{1}{16}$, $1\frac{1}{2}$ Hex	$1\frac{1}{2}$, 3	$1\frac{1}{2}$, 3	"
Allegheny Ludlum Steel Corp.—"Carmet"	W	"	Handheld drills	$\frac{1}{2}$, $\frac{3}{8}$ Sq	$1\frac{1}{2}$, 3	$1\frac{1}{2}$, 3	Finger bit, with or without retainer-pin hole, for M2, M3 heads
	WW	"	Handheld and power-fed drills, all conditions	$\frac{1}{2}$ Sq	$1\frac{1}{2}$, 2	$1\frac{1}{2}$, 2	Two-prong, V-design for fast penetration
	VL	"	Power drilling, considerable impurities	$\frac{1}{2}$, $\frac{3}{8}$ Sq	$1\frac{1}{2}$, 2	$1\frac{1}{2}$, 2	Two-prong, fluted shank, fast penetration
	UL	"	Large holes for Airco-Cardox	$1\frac{1}{2}$ Hex	$2\frac{1}{2}$	$2\frac{1}{2}$	Has short sturdy fingers
Newcomer Products, Inc.	NP	"	General drilling	$\frac{1}{2}$, $\frac{3}{8}$ Sq, $\frac{1}{16}$ Hex	$1\frac{1}{2}$, 3	$1\frac{1}{2}$, 3	Two-prong, for coal with impurities
Metal Carbides Corp.—"Taldie"	DM	"	Machine or post mounted drilling	$\frac{1}{2}$, $\frac{3}{8}$ Sq, $\frac{1}{16}$, $1\frac{1}{2}$ Hex	$\frac{3}{4}$, $1\frac{1}{2}$	$1\frac{1}{2}$, $3\frac{1}{2}$	Two-prong; wide throat, extra clearance

pelled power-driven machines have stronger and shorter prongs and wide carbide inserts to withstand the more-severe service.

Carbide-Tipped Roof Bits

Carbide-tipped rotary rock bits come in three shank styles: slotted two-prong, notched, and solid.

The slotted, or two-prong, design differs from a coal bit only in that the prongs are shorter and heavier. Hence the slot is narrower. A slotted bit produces a clean, straight hole faster than a solid-insert bit but is recommended only for drilling the softer, friable formations.

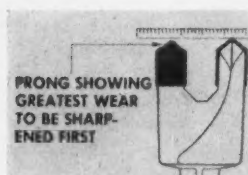
A notched design provides fast drilling in medium to hard rock yet is strong enough for use with powerful coal or roof-bolting drills. Where the most severe drilling is in the upper part of a bolt hole some mines successfully use a notched bit as a starter and a solid-insert bit to finish the hole. Thus the best bit is used for each condition and oversized holes which might result from using an oversized starting bit instead of a finishing bit are eliminated.

Solid-insert bits provide versatility and fast, economical drilling in widely varying roof. The heavier shank design minimizes broken tips resulting from high pressures available in modern drills. This style of bit also facilitates use of a harder grade of carbide for longer tool life.

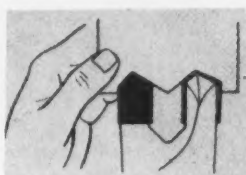
Shanks usually are square for bits up to 2-in and hexagonal for the larger sizes. Shanks also may be obtained with water grooves for wet drilling to control dust.

A significant recent development in rotary roof drilling is the application of through-steel internal dust removal. Bits for this service employ a key-type design and flat shank rather than the usual conventional square design.

The flat shank has a hole in it so that it can be secured to the drill steel with a cotter pin or nail. To provide a slot for the bit, the drill steel in turn is flattened at the end. Immediately below the flattened portion are two $\frac{3}{4}$ -in holes through which dust enters the steel. The steel in 1-in O. D., $\frac{3}{4}$ -in I. D. aircraft tubing with a 1 $\frac{1}{2}$ -in square drive on the bottom. A 2-in diameter washer, $\frac{3}{8}$ -in thick, added on the steel above the drive takes the upward thrust of the drill.

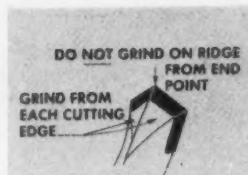


Sharpen prong showing most wear first. Grind prongs to equal length.

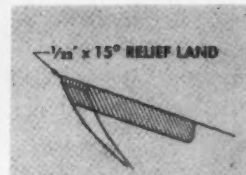


Resharpener Prong-Type Auger Bits

Use template to help maintain original angles and clearance.



Grind steel away from cutting edge and blend into original shank contour.



Grind relief angle on each tip for faster cutting action.

Getting Maximum Life From Rotary Carbide Roof Bits

Roof-bolt hole drilling with a rotary unit is a two-stage operation. First the carbide bit tip is forced a short distance into the roof by the thrust action of the drill feed. Second, the bit is rotated to clean away the rock to the depth of penetration.

Too great rotational speed in relation to low thrust will cause a solid-insert bit to rub or grind rather than cut. The result is rapid dulling of the bit and increased frictional heat. This heat tends to destroy the tip-holding properties of the braze and the heat-treat characteristics of the steel.

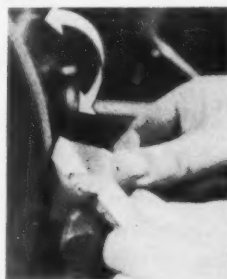
If the thrust is too great in relation to cutting speed the bit drills faster than the cuttings can be removed. Excessive cuttings choke the auger steel and bit and may cause steel breakage or machine stalling, as well as excessive bit wear.

To get the maximum life from roof bits, keep the proper balance between thrust and rotational speed to let the bit cut continuously and keep the hole free of cuttings. To speed drilling in shale, loosely cemented limestone and similar rocks carbide engineers recommend operating the drill at maximum RPM, increasing the thrust until the drill approaches stalling. Holes not only can be drilled faster, but the maximum volume of material can be removed per drill revolution, with maximum bit life.

In hard formations, the best way to avoid burning up bits is to reduce rotational speed and increase thrust. This forces the bit into the hard formation and provides better cutting action with less bit wear.

Finger and Drag Bits

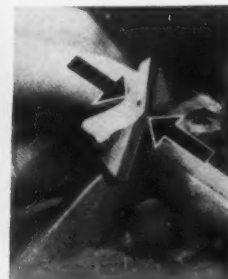
Finger bits are available in both alloy-steel throwaway and carbide-insert designs which may be secured to cutter heads by cotter pins, wedges



Use aluminum oxide wheel and rolling action to blend steel into heel radius.



Grind insert on silicon carbide wheel. Follow original shape and angles.



Thin out carbide web on silicon carbide wheel. Grind from cutting side.

Resharpener Spade-Type Roof-Bolting Bits



Use aluminum oxide wheel to remove steel from end of bit under insert.



Use aluminum oxide wheel to grind steel from side and nose below carbide.



Use silicon carbide wheel to blend carbide tip into steel shank.

Resharpener Cutter Bits

or set screws. Employed for drilling both coal and rock they are used on heads that cut holes with diameters ranging from 1 7/8 to 48 in.

Carbide-insert or boron-hardened fingers frequently are used to drill materials that are too solid to be drilled with a three-prong carbide-insert bit yet are not sufficiently hard or abrasive to require a multiple-bit head with a pilot or core breaker.

Drag bits have wide carbide inserts and are used for drilling materials too hard for a steel bit and not hard enough to require a diamond drill. In coal operations, a drag bit could be used for drilling grouting holes in

hard slate, hard shale, limestone or other medium materials.

When to Recondition Carbide Mining Bits

A planned reconditioning program for cutter and drill bits will pay dividends in longer bit life and lower bit cost per ton of coal. Good bit maintenance procedures begin with setting maximum wear standards for cutting edges on each type of bit. By removing a bit from service when wear reaches this limit, carbide grinding wheels and time can be saved. And a sharp bit does the work faster

Cutter and Drill Bits

and with less strain on the machine. In reconditioning any type of carbide bit, maintain the original clearance angles and contours as closely as possible.

The following suggestions are offered for getting longer, more effective service from bits.

Machine Bits—Bits should be removed when they show a wear land on the cutting edge approximately $\frac{1}{32}$ in wide. Greater wear slows cutting action and increases the chances of tip or shank breakage. And reconditioning becomes more costly in man-hours and wheel life.

Roof-Drill Bits—A wear land equal to one-third to one-half the thickness of the tip indicates that the bit should be removed from service and reground. A dull bit penetrates slower, requires more power and overheats, reducing bit life by damaging braze characteristics and destroying the heat-treat properties of the steel. Drilling with dull bits also may promote drill-steel breakage.

Auger Bits—When the point of either prong becomes chipped or the wear land becomes $\frac{1}{32}$ in or about one-third of the insert thickness, auger bits should be reconditioned. If one prong is worn more than the other, both tips must be reground to equal length.

Finger Bits—A wear land of $\frac{1}{32}$ in on the cutting edge indicates that a finger bit should be reconditioned; also when it is severely chipped.

Five Basic Rules For Reconditioning Carbide Bits

1. Maintain Original Angles—When regrounding carbide bits, maintain the original profile or contour as closely as possible. Duplicate all clearance and relief angles, keep the same nose and heel radius and be sure to retain enough steel to support the carbide. Longer life results if the original bit shape is correctly maintained during regrounding.

2. Grind Bits Dry—Dry grinding is recommended when resharpener mining bits for these reasons: no chance of cracking carbide by use of insufficient coolant; better visibility when grinding; longer tool and wheel life as a result of better control of grinding action.

3. Keep Bits in Motion—Bits should be moved constantly when in contact with the grinding wheel to reduce heat concentration which may dam-

age the tool. This practice also reduces uneven wheel wear. A side-to-side, up-and-down motion can be used, depending on the type of bit.

4. Use Correct Grinding Wheel—Carbide bits must be sharpened on a silicon-carbide wheel. Steel can be ground with these wheels but the wheels will last longer and grind better if the steel portion of the bit is ground first on an aluminum-oxide wheel designed for steel.

The following wheels are generally used: Silicon carbide, 60-grit, for carbide; aluminum oxide, 24-grit, for steel. A 10-in diameter cup-shaped wheel frequently is recommended for reconditioning carbide bits.

5. Do Not Quench—Carbide bits should not be quenched in water during or immediately after grinding. Quenching can cause hairline cracks in the carbide and greatly reduce bit life.

Why Bit Maintenance Is Important

Good reconditioning procedures have been known to double the life of bits, greatly improve their performance and reduce bit costs proportionately. To get these results the right bit style and type of carbide first must be selected for a particular machine and operating condition. Bit manufacturers can supply various styles of bits and grades of carbide but the mining company must set up the proper maintenance procedures.

In setting up a bit maintenance program remember that a sharp bit does work faster with less strain on equipment. Bit changing schedules therefore should be established for individual conditions which vary from time to time to prevent bits from being used too long.

Although a systematic changing schedule is of major importance in bit maintenance, daily inspection and bit spotting are needed as a guide in scheduling bit changes. Bit spotting will prevent coring, and overloading other bits and the machine, decrease in machine output. Furthermore, dull bits frequently are damaged beyond repair if not replaced.

Machine operators should be trained to replace bits when there is a $\frac{1}{32}$ -in wear land across the cutting edge. Aside from watching bit wear, operators should be alert to machine overloading and slower penetration as signs for worn-bit replacement.

Good supervision, as well as effective maintenance practices, is vital in good bit life and performance. Excessive bit wear or failure may be caused by sudden changes in drilling or cutting conditions as well by poor maintenance of the machine. For example, broken cutterbar guides, and broken or missing setscrews on lugs contribute to poor bit performance. Furthermore, to divide the load among the bits, cutter chains must be properly laced.

An accurate record of bit performance on each section and shift is a valuable guide in evaluating bit performance and minimizing bit costs. Some companies have found it profitable to use bit inventory sheets for a running daily summary of section bit performance. With the aid of such a control sheet any unusual changes in performance can be detected.

Proper bit reconditioning procedures, next to removing a bit from service before wear becomes too great, provide the best opportunity to minimize bit costs. Good bit reconditioning begins with careful selection and training of men to do the grinding job. In many instances bit grinding is regarded as an extra shop job to be done at a convenient time by any available person, regardless of whether he is trained in proper grinding techniques. As a consequence, original bit contours and carbide angles are not maintained, and bit life is correspondingly lowered. Contrariwise, an intelligent, reliable worker trained in proper bit-grinding procedures not only will restore bits to their original shape but also will keep necessary inventory records.

Acknowledgment

The editors are deeply grateful to the manufacturers of cutter and drill bits for much of the material in this Operating Guide. Their names with the products they offer appear in the accompanying bit lists. As far as information was available either through direct communication or catalogs and literature, these lists attempt to show bits presently available by major categories of service.

Reprints of this Operating Guide are available and may be obtained as long as the supply lasts at a single copy price of 25¢. Write The Editor, *Coal Age*, 330 West 42nd St., New York 36, N.Y.

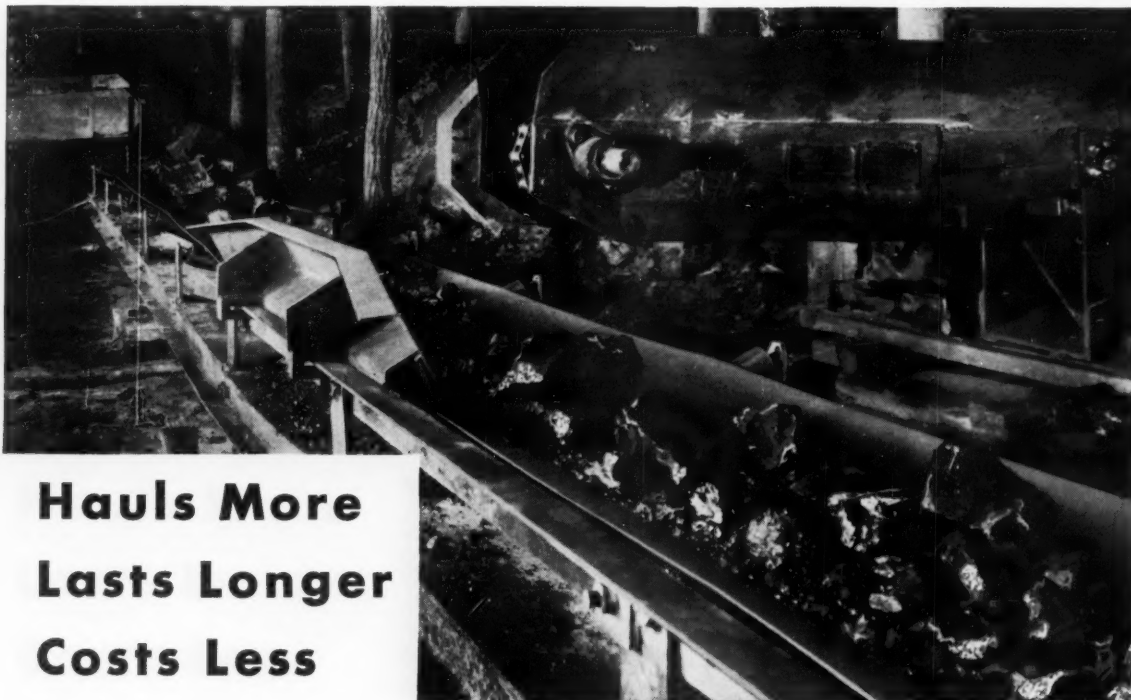


Hulburt

OIL & GREASE COMPANY

Philadelphia 34, Pennsylvania

NEW R/M "COALMOVER"



**Hauls More
Lasts Longer
Costs Less**

Compare its advantages

with any other Conveyor Belt on the Market

- Lighter Weight for Easy Handling & Re-spooling
- Holds *All* Underground Types of Fasteners Longer
- Solid Edge Construction Eliminates Fray & Fan Out
- Engineered to Haul *Either* Side—Top or Bottom
- Higher Pulley Grip at Lower Tension—No Slip
- High Coefficient of Friction—No Coal Slippage as with Plastic
- Exclusive R/M Flexibility Over Reverse Bend & Snub Pulleys
- Natural Training, Easy Troughing, Full Loads in Low Headroom
- Maximum Resistance to Rips, Gouging and Abrasion, Impact
- Requires Minimum Take-up Adjustment—Low Stretch
- Will Not Stiffen at Low Temperature—Not Thermoplastic
- Designated "Fire Resistant, U.S.B.M. No. 28-10"

Meet the new standard for performance in your mining operations. Let an R/M representative demonstrate the advantages you get only with new R/M "Coalmover" Conveyor Belt.

RM 1025

RAYBESTOS-MANHATTAN, INC.
MANHATTAN RUBBER DIVISION, PASSAIC, NEW JERSEY



ENGINEERED
RUBBER
PRODUCTS
... MORE USE
PER DOLLAR

AN EXTRAORDINARY PUBLISHING ACHIEVEMENT OF OUR TIME!

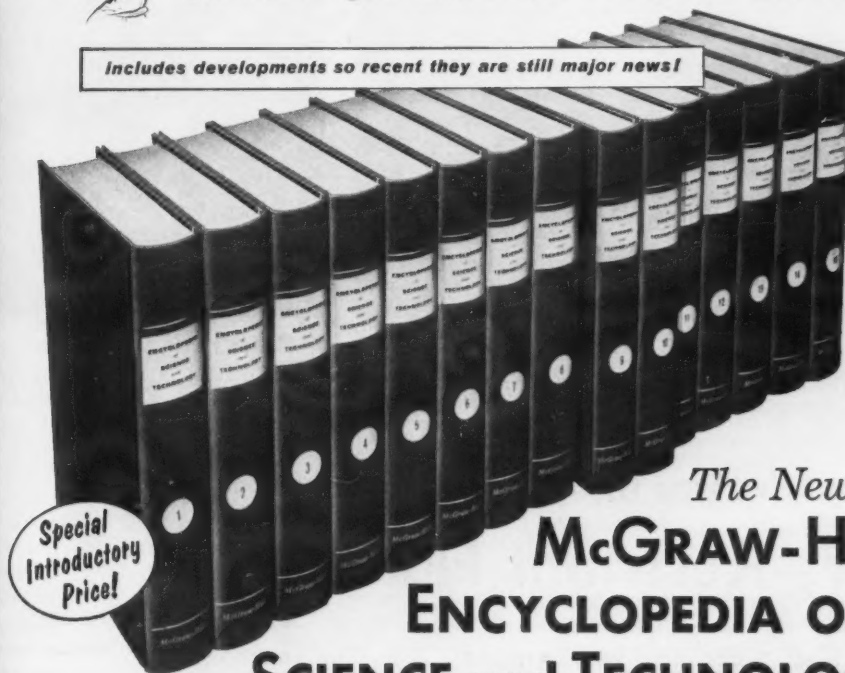
Here Are the Many
Fields Covered:

ACOUSTICS
AERONAUTICAL
AIRFRAMES
AGRICULTURE & SOILS
ANIMAL ANATOMY
PLANT ANATOMY
ANIMAL SYSTEMATICS
ASTRONOMY
ATOMIC, MOLECULAR AND
NUCLEAR PHYSICS
BIOCHEMISTRY
BIOPHYSICS
CHEMICAL ENGINEERING
ANALYTICAL CHEMISTRY
INORGANIC CHEMISTRY
ORGANIC CHEMISTRY
PHYSICAL CHEMISTRY
CIVIL ENGINEERING
COMMUNICATIONS
CONSERVATION
CONTROL SYSTEMS
CYTOLOGY
ANIMAL ECOLOGY
PLANT ECOLOGY
ELECTRICAL
ENGINEERING
ELECTRICITY
ELECTRONICS
FLIGHT SCIENCE
FOOD ENGINEERING
FORESTRY
GENETICS & EVOLUTION
GEOCHEMISTRY
PHYSICAL GEOGRAPHY
SURFICIAL AND
HISTORICAL GEOLOGY
GEOPHYSICS
GRAPHIC ARTS
GROWTH AND
MORPHOGENESIS
HEAT
INDUSTRIAL AND
PRODUCTION ENGG.
LOW TEMPERATURE
PHYSICS
MACHINE DESIGN
MATHEMATICS
MECHANICAL POWER
CLASSICAL MECHANICS
METALLURGICAL
ENGINEERING
METEOROLOGY AND
CLIMATOLOGY
MICROBIOLOGY
MEDICAL MICROBIOLOGY
MINERALOGY AND
PETROLOGY
MINING ENGINEERING
NAVAL ARCHITECTURE
AND MARINE ENGG.
NUCLEAR ENGINEERING
OCEANOGRAPHY
OPTICS
PALEONTOLOGY
ANIMAL PATHOLOGY
PLANT PATHOLOGY
PETROLEUM CHEMISTRY
PETROLEUM ENGINEERING
GENERAL PHYSIOLOGY
PLANT PHYSIOLOGY
SOLID STATE PHYSICS
THEORETICAL PHYSICS
PLANT TAXONOMY
PROPULSION
PHYSIOLOGICAL AND
EXPERIMENTAL
PSYCHOLOGY
INVERTEBRATE ZOOLOGY



The Entire Span of Today's Scientific, Engineering
and Technical Knowledge Encompassed in a Monumental
Reference Work Containing 8,500 pages of Text,
800 Index Pages, 7,200 Articles and 9,700 Illustrations.

Includes developments so recent they are still major news!



Special
Introductory
Price!

The New McGraw-Hill ENCYCLOPEDIA OF SCIENCE and TECHNOLOGY

2,015 Contributors, including Nobel Prize Winners, Respected Leaders of Research and
Industry... Over 6,000,000 Words — from Concise Articles to Amazingly Comprehensive
Treatments... 100,000-Entry Index... a Wealth of Maps, Charts, Diagrams,
Drawings, Photographs... many more than in any comparable work of reference.

AN epoch-marking publishing venture — providing up-to-date, authoritative information on all the sciences of our day — is being completed. The new McGraw-Hill ENCYCLOPEDIA OF SCIENCE AND TECHNOLOGY will make readily accessible within its 15 volumes a vast fund of knowledge covering hundreds upon hundreds of subjects dealing with the whole spectrum of the physical sciences, life sciences, earth sciences, and engineering.

This major work fulfills a prime need of the scientist, the engineer, the technician — whether concerned with pure research or practical applications — whether his work is of a design or operating nature — whether he wants to review or keep abreast of the vastly enlarged knowledge of his own field or must bridge the gap between his specialty and unfamiliar areas into which his work leads him.

Unequaled in Timeliness, Clarity, Depth

This unique library makes it possible for you to have as near as your office, laboratory, plant, or home an all-knowing corps of specialists to which you can turn for precise, authoritative information. You can get answers to specific questions raised through daily professional activities or simply explore in a random way the universe of today's scientific, engineering, and technical knowledge — distilled into 7,224 comprehensive articles. Whatever your own field, whatever field your work is related to, you will find it here.

A Work of Unsurpassed Authority

The names of the contributors read like a "Who's Who" of the world's scientific community. All are recognized specialists — in many instances, articles

were written by the very person credited with new discoveries and developments in a given field. Among them are Nobel Prize Winners and others who have distinguished themselves for their original and significant work.

Nothing comparable in breadth of conception, in authority, in usefulness, has ever before been offered in a reference work of this kind. As an all-embracing general reference or a practical working tool, this Encyclopedia belongs in the home and professional library of everyone with an interest in science and engineering. An annual Supplement Volume keeps it always up to date.

By reserving your first edition set now, you will enjoy the benefit of a special money-saving introductory price. Mail the coupon for full details.

MAIL THIS COUPON

McGraw-Hill Book Company, Dept. C-9
327 West 41 Street,
New York 36, New York

Please send me without obligation your pre-view brochure on the new McGraw-Hill ENCYCLOPEDIA OF SCIENCE AND TECHNOLOGY in 15 volumes; also details of your introductory price offer and terms of payment. (No salesman will call.)

Name.....

Address.....

City & Zone.....

State.....

C-9



It Burns



It Doesn't

USBM photos.

GRAPHIC PROOF of the fire-resistant qualities of the nonflammable hydraulic fluids is provided by this USBM demonstration. Butane torch at left sets off flammable petroleum fluid. No ignition takes place with water-in-oil emulsion (right).

Much Safer, Some Types Less Expensive in the Long Run . . .

Fire-Resistant Fluids

What water-in-oil emulsions are, how they function in service, how good they are, and how they should be introduced and evaluated.

David H. Michael
General Manager, Hulburt Oil & Grease Co., Philadelphia

DISASTROUS MINE FIRES resulting in loss of life, production and equipment have given impetus to the development of reasonably-priced and efficient fire-resistant hydraulic fluids to replace flammable oils which create hazardous conditions at the mine face.

There seems to be little question that the hydraulic fluid of the future in the coal-mining industry will be a new fire-resistant-type fluid: the water-in-oil emulsion. Previously, there have been two other fire-resistant fluids in use in other industries: first, the straight synthetic-type fluid, which was priced in the range of \$3 to \$4 per gallon; second, the water-glycol fluid, at \$2 to \$3 per gallon. These relatively expensive fluids have done a good job, but because of their high cost have shown little promise

for coal-mining applications. With the water-in-oil emulsion, priced in the range from \$0.50 to \$1.50 per gallon, there is great promise for successful application. Therefore, in this article, we shall deal only with the emulsion type.

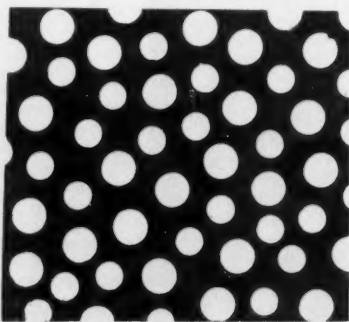
What Is an Emulsion?

An emulsion is a dispersion of one liquid in another where the two liquids are essentially immiscible (unmixable). There is an old proverb that says: "Oil and water do not mix," yet the most common emulsions are mixtures of water and oil in a stable homogeneous dispersion. Cosmetic creams, salad dressings and floor waxes are examples of common everyday emulsions with which all of us are familiar.

In every emulsion there are two parts—the dispersed part and the continuous part. The dispersed part can be pictured as tiny globules, which

in turn are completely and at all times surrounded by the continuous part of the emulsion.

Anyone using or contemplating the use of fire resistant water-in-oil emulsions should register firmly in his mind the picture of the emulsion in the accompanying illustration. Certainly,



this picture is an over-simplification of the complexity of the emulsion system, but for the purpose of general understanding it illustrates rather clearly the basic idea why these emulsions can do their job as hydraulic lubricants. One can see that the water in the emulsion is completely surrounded or trapped by the oil. We can then picture the water as being innocuous in the system. It is, for

all practical purposes, completely tied up and out of play. The oil, the continuous part of the emulsion, does all the work. It lubricates. It prevents rust. It carries the additives for anti-wear and antioxidation. The theory is that it does these things just as it always did because the water is kept firmly on the "inside" and out of play.

But if water and oil do not mix, what keeps the water tied up? When a hydraulic system runs hot, as it often does, doesn't steam come off and doesn't that mean that the water is loose? Let's answer the first question:

Chemicals called surface-active agents, properly selected, can either tie the water inside the oil or, in a different chemical nature the oil inside the water. For lubricating and hydraulic purposes, of course, we choose surface-active agents which keep the water on the inside. What is a surface-active agent?

For purposes of this discussion, let's think of it as having molecules chemically oriented such that one end of the molecule attracts oil and the other water. In this again over-simplified explanation we can picture certain emulsifiers acting as little "knots" which tie up the water globules and hold them by various means in suspension and dispersion uniformly throughout the oil. Certainly the water particles will come out in the form of steam when the temperature is sufficiently high. This fact is not alarming. Rather it is expected. The steam rises to the top of the hydraulic sump, condenses on the lid and drops back as free water. On re-entering the emulsion, however, it is instantly re-emulsified, or as stated in our simplified fashion, it is dispersed and tied up again by surface-active agents.

40% Water—60% Oil

There are hundreds of different types of emulsions and although most are closely related a few vary widely as to their basic nature and performance. All, however, have certain common properties. For example, to earn Bureau of Mines approval for fire resistance, all oil emulsions must have at least 38% water. Therefore most emulsions usually carry 40% water.

When the fluid is in mining machinery, at working temperatures even as low as 150 F, there will be vaporization and loss of water. The amount



THE AUTHOR—Mr. Michael, Hulburt general manager, has been responsible for research into emulsion-type fire-resistant hydraulic fluids for the Hulburt Oil & Grease Co. from the inception of the program in 1954 to the appointment of a new research director in the summer of 1960.

lost will vary in relation to temperature and the tightness of the hydraulic system. Each supplier of fire-resistant fluid (FRF) will have his own method of quickly determining the water content in the emulsion by testing samples drawn from the machine. Actually, water content can drop to as low as 25 or 30% and the fluid will still have fire resistance far superior to ordinary straight oils. Nevertheless, when water content drops off, fire resistance is degraded and every effort should be made to keep the water content close to 40%.

Steam Puts the Fire Out

While on the subject of water content and amount of water present, let's consider the effects of the water in the emulsion. First of all—and most important—the water is the only item in an emulsion which contributes to the fire-resistance safety factor of the fluid. Flash and fire points of the fluid are unchanged. The oil and other additives have no greater safety factor than available in conventional straight oils, but the water present provides all the safety needed or, at least, imparts a safety factor far greater than one would normally expect.

When a hose breaks and burning hot oil is sprayed about it may, for example, come in contact with an

electric arc from a broken cable. With conventional straight petroleum oils a raging fire is the instantaneous result. With the water-in-oil emulsion, however, as fast as the oil can break into flame the water becomes steam. The steam blankets the flame and there simply is no perpetuation.

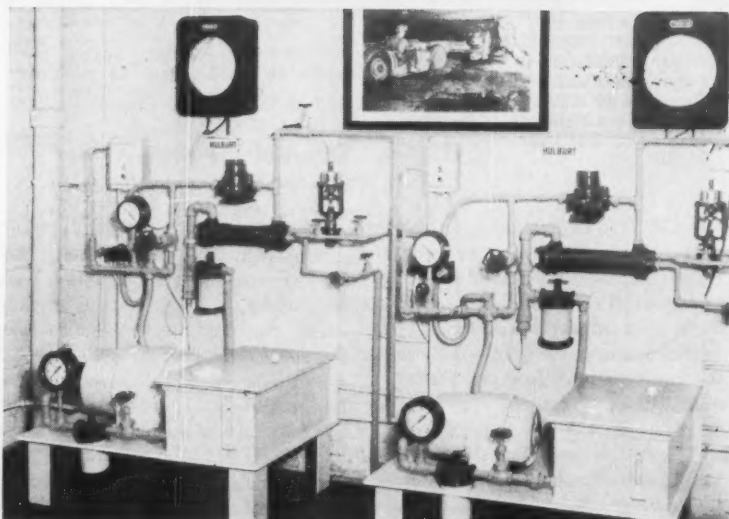
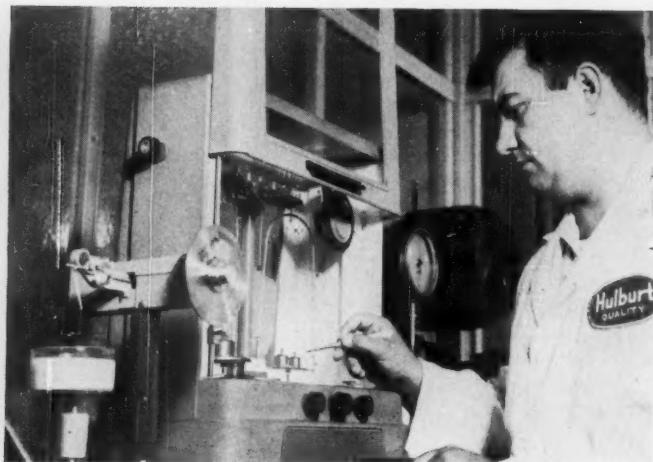
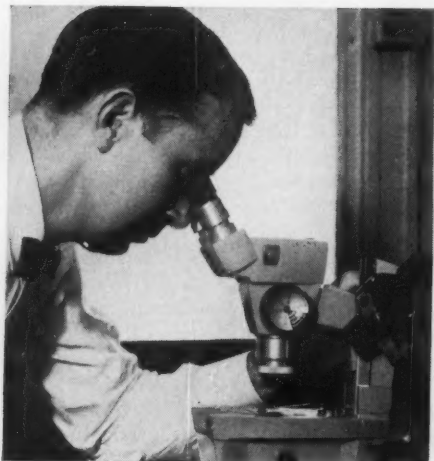
The Bureau of Mines, under the direction of W. D. Walker and S. P. Polack, has done a superb job over the past few years in studying the properties of water-in-oil emulsions, the causes of mine fires, and the increased safety factor when emulsions are used. It is of real interest and inspiration to see the Bureau of Mines tests, which are required for bureau approval of fire-resistant fluids. You may be sure that their multiple series of tests cover, in a realistic way, every condition which might be encountered in an underground mine fire.

Surprise! The More Water The Heavier the Viscosity

In a water-in-oil emulsion, the emulsion with 40% water is noticeably heavier than the same emulsion with 30% water. Additional water actually makes the fluid heavier rather than lighter in viscosity. In one field test a hydraulic engineer had occasion to add additional water to a system. For two days he added 1 gal of water each shift. With each addition, the operators claimed the machine worked better. Of course, when the water content dropped back to 40%, no more was added. The machine operators were very pleased and the engineer still gets such comments as, "That water's all right. How much is it going to cost us?"

At least, we were over the first hump at this mine. The operating men were no longer nervous at our putting water in their machines. The additional water did make the machine cut better because it raised the viscosity of the fluid. In regard to viscosity, it is of interest to note that at least one emulsion on the market has a viscosity as high as 1,300 sec at 100 F. With petroleum oil the maximum permissible viscosity for any pump has been 750 sec at 100 F.

A detailed explanation of why this extremely high viscosity is permissible is of no real importance, but the fact is mentioned here to explain two important items. Consumption of certain



Behind the Product

RESEARCH is the key to performance in the field. This group of research-laboratory illustrations includes the view (alongside) of pump stands employed in testing fire-resistant fluids. Vane, piston and gear pumps can be used on these stands at varied pressures and volumes. Tests for wear include examination of pump parts, in this instance by Dr. R. E. Farris, Hulburt director of research, using a stereo microscope (upper left), and weighing, as by the technician in the upper right view. Parts are weighed every 200 hr and tests usually are continued up to 1,000 hr.

emulsions may be only one-half that experienced with petroleum oil, and secondly, the emulsions differ markedly in many ways from petroleum oils. Having tested one emulsion a mine operator cannot feel he knows all emulsions. Far from it. Emulsions now on the market differ widely in composition and vary in performance because of the very complex and diverse nature of the emulsion systems.

How Good Are the Emulsions? As Good As Petroleum Oils?

Sooner or later this question must be answered. Any answer involves the relative performance of the emulsion compared to presently used conventional hydraulic oils. Therefore it is necessary to discuss for a moment the merits of the conventional oils

which have been in use in the mining industry over the past few years.

We believe that the hydraulic system of a mining machine is the very heart and blood stream of a mechanized mining operation. Other failures that can occur in a mining operation usually are readily recognized and corrected, but when a hydraulic system is sluggish it is like a half-sick quarterback directing a team. It would be better for the team if he broke his leg and was replaced, rather than have the half efficiency go unnoticed.

A hydraulic system will cut coal with a poor fluid. Indeed, against equipment manufacturers' strongest recommendations the cheapest sorts of oils have been dumped upon or bought by the coal industry for years. The machines have nevertheless cut

coal, although at only 50 to 70% efficiency. That means a dollar invested is only earning 50 to 70% of what it should, and that a man's labor is only 50 to 70% gainful. In short, to save a penny per ton on initial lube cost dollars have been thrown away by inefficient machine operation.

We are unusually emphatic on this subject and fight not just for a particular branded product, but for the general use of quality lubricants. Equipment and pump manufacturers—in fact, everyone who should know—most emphatically state that a quality lubricant must be used to obtain optimum hydraulic efficiency.

Therefore, we begin with the fact that a "good-enough" emulsion must be *better* than a conventional straight oil of a cheap grade. Anything less than this is a step backward. Several

oil companies are at this time beginning to show the results of intensive research in the hydraulic-emulsion field with product field testing of their emulsions. Before going into the field much realistic testing has been performed in the laboratories. An accompanying illustration shows pump stands which typify the most common practice in laboratory evaluation. These pump tests are run with *actual* pumps at *realistic* pressures and are run for many hundreds of hours.

My own company has five complete stands incorporating every possible graphic recording control to provide complete recorded data on temperatures and pressures throughout the tests. As shown in another illustration all parts are weighed periodically to 1/10th of a milligram for increments of wear. In our work, coal dust, rock dust and various mine waters have been added as contaminants. Tests have been run both with low rates of consumption and with extreme high rates, as might be encountered with hose breakage.

Not just pump life has been studied, but also the nature of pump wear under contamination conditions. A pump can have long life to final failure, but be inefficient throughout the latter half of this life. Such pump behavior can be caused by the nature and type of wear taking place in a contaminated hydraulic system. These matters can be corrected by additives and changes in emulsifiers.

Rust inhibition, oxidation stability, polar lubricity, antiwear lubricity, foam inhibition and mild "EP" properties had to be incorporated into the emulsion and emulsifiers had to be found which would be compatible with these additives. New and distinct problems arose, such as, rust occurring on the top of sumps where steam constantly washed away the oil. This is called vapor-phase rust and additives which rise with the steam and plate out on the bare surfaces are called vapor-phase rust inhibitors. Even special rust inhibitors that are soluble in water and stay in at all times are used for added protection.

Finally much work was done to ensure that the resultant formulation was completely compatible with all rubbers, gaskets, seals and paints commonly used in mining hydraulic equipment.

All data to date indicate that there

need be no modification whatsoever in a hydraulic system when changing to a water-in-oil emulsion. The only possible exception would be that some emulsions may be injured by screens finer than 60 mesh.

A good emulsion is a better hydraulic fluid than a cheap oil. It is far less expensive overall and approaches the quality of the best premium hydraulic oils.

We believe, and our past information indicates, that a good emulsion can out-perform in every way the cheap oils which presently dominate the mining-industry picture. We cannot expect the emulsion to lubricate a pump better or give better hydraulic performance than the premium lubricants now used. Some top-quality emulsions may, on the other hand, be appreciably less expensive than the premium oils by virtue of a *much-lower* consumption pattern.

Mines Evaluation— A Difficult Problem

Coal-mine hydraulic pumps are frequently rebuilt pumps. The failure of rebuilt pumps and new pumps results from numerous causes, often completely unrelated to the hydraulic fluid. At one mine pumps will normally last a year on a given type machine. At another mine 6 mo may be the normal expected pump life. At either mine two pumps often will be put on the same machine in a 2-day period—and neither will work properly. Many mines have not received adequate information regarding the proper testing of a hydraulic system to find the source of trouble. Still fewer mines have the proper equipment to run such a checkout of each circuit in a system.

Wherever we introduce an emulsion, my company stresses that a very exact and orderly procedure should be followed to properly ensure complete evaluation of the fluid by all concerned:

1. Our engineer should be allowed to instruct and assist in the installation of the fluid.

2. He sees that a consumption pattern on the *old oil* is determined for a period of time before the emulsion is brought to the mine. If a mine uses 5 gal a day of the old oil and only 2 gal of the emulsion, then ob-

viously the emulsion does not cost 69c a gallon but, relatively speaking, only about 30c a gallon. These things should be proved or disproved, not decided on the basis of just conversation.

3. The engineer, along with qualified mine personnel, tests out the entire hydraulic circuit while the old oil is still in use. Pressures, volumes and temperatures are all recorded and kept on record. Relief-valve settings, oil temperatures, number of cuts per shift, tonnages loaded, hardness of coal and other general mining conditions are all noted and recorded. All this is done for a period of 1 to 2 wk prior to changing out the *old oil*.


4. The emulsion is then put into the machine in a simple and exact procedure, again under the supervision of our serviceman.

5. With the emulsion now installed, the data listed in Step 3 are again gathered and compared with the data on the old oil. Schroeder hydraulic circuit tests are continually run to determine if the pump is holding volume and pressure. Water-content checks are run on the spot and samples of the fluid are repeatedly sent to the home laboratory for complete evaluation.

We have completed 7 yr of research on emulsions. The past 2 yr has seen our research budget tripled to expedite full-scale production operation and field trials. Less than 2 mo ago we engaged a nationally known director of research for a large chemical company to head our expanded R & D Dept. We are now using the newest and fastest Piper single-engine airplane to expedite the transportation of technical personnel between the mines and our research laboratory.

All of this is in anticipation of what we expect to be a new era in hydraulic lubrication in the mining industry. It will take hard work, understanding, and better knowledge on the part of all mine personnel. But when human life is at stake Americans seems to always persist in seeing that humanity and safe working conditions come far ahead of expediency and the natural tendency to resist change.





FROM THE BRITTLE COLD OF MINNESOTA'S MESABI RANGE
TO THE SOFTENING HEAT OF FLORIDA'S PHOSPHATE MINES—

Anaconda's new all-butyl Shovel Cable passes every life test

Heat, cold, kinks, even runovers and rock falls couldn't knock out this new shovel cable during months and months of torture-testing around the country.

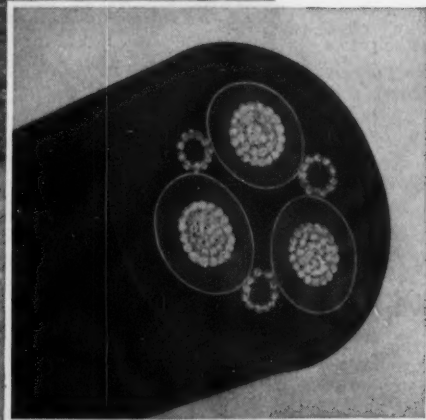
That's because its new all-butyl *insulation* and *jacket* make it the toughest shovel cable you can buy. And—one of the most economical over the long haul. Anaconda's new process butyl—as an insulation—has proved its ability to take pinching, crushing and the effects of moisture and ozone in many fields—from extra-high-voltage power cable to surface mining. And now it's available to you as a *jacket* in Anaconda's new shovel-cable construction.

Because of its superb service record, the inner construction of this new cable remains the same. For example, you still get Anaconda's patented rubber-core grounding conductors which minimize wire breaking and offer greater ground protection. Also included are special shields of copper cross-braided with cotton—a construction which makes the braided shield lie flatter and eliminates chafing. In addition, this feature makes for much easier and faster splicing. Both electrically and mechanically, Anaconda shields are superior to all-metal construction.

Only Anaconda offers you this job-tested shovel cable with all these construction extras in a proven design. Add up the features—they mean extra cable life and dollar savings.

So, call the Man from Anaconda and ask him about the new Anaconda all-butyl Shovel Cable. Or write: The Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y.

00258



ASK THE MAN FROM

ANACONDA[®]

ABOUT THE ALL-BUTYL SHOVEL CABLE

Another New Product From Anaconda's Rubber Cable Center

Note the heavy-duty weather-resistant butyl jacket—the rubber core grounding wires—also see how the ground wires make constant contact with conductor shields.

Foremen's Forum

The Foreman and His Boss

By R. B. Hewes, Professor of Mineral Industries Continuing Education, Pennsylvania State University, University Park, Pa.

NOT LONG AGO the supervisors at a certain mine were called into a meeting with their superiors to "discuss" a breakdown in quality. There was little question as to what was causing the trouble, it had been gone over many times before. In some cases dirty cuttings were being loaded with the coal, in others a tender roof slate was coming down with the coal and breaking up too fine to be removed easily. Sampling was done by sections, so that it was possible to determine sectional performance.

Within a day or so after that meeting those same supervisors attended a conference on supervisory problems, part of a regular program of such meetings. The memory of the quality meeting was still raw in their minds and they wanted to talk about it, so I temporarily set aside the scheduled discussion and allowed them to go ahead.

Their main complaint was about the lack of demonstrated understanding of their problems and the absence of any real help from their superiors when troubles arise. They claimed that they were faced on the one hand by conditions, equipment and men that contribute to delays, poor quality and lost tonnage, and on the other hand by an attitude of suspicion and censure on the part of their superiors.

"I believe that my boss is asking me to do something that has never been done, and that he couldn't do it himself," said one supervisor. When I try to show him that I'm getting more water in my places that I've had before, and that the equipment I have and the men I'm allotted are not enough to keep my working places dry so that I can get the cutting loaded out clean, he says I'm alibiing. If there's a better way to use my men and equipment, I get no help in discovering it."

"If I'm making mistakes they must cost the Company money, and you'd think my boss would get them straightened out the quickest possible way if he wants to keep cost down."

"We've always had this draw slate," said another, "and to the best of my knowledge no one has ever learned how to keep it out of the coal. Sometimes it breaks up and sometimes it doesn't. Sometimes the breaking is caused by a bad shot, but many times the shots are well placed and it still breaks. If anyone knows how to correct it I wish they'd tell me instead of making me feel as though they think I planted it there. Watchfulness will help to a certain extent, but when that isn't enough then someone who knows more about it than I do ought to tell me what I can do next."

"It's not enough to stand up in a meeting and say 'This has to be stopped' or 'You fellows aren't on the ball,'" added a third supervisor. "If we're slipping, there must be proof for it, so why can't we be shown our mistake and how to correct it. The way it is now, it sounds as if the boss knows the answer but is keeping it a secret and we'd better scramble to find out what it is. If we tried that on our men, I wonder how far we'd get?"

These undercurrents of disagreement among the management organization of any company certainly do not indicate the cooperative and coordinated action that is necessary to meet a tough competitive situation. At one time management could and did practice the philosophy of "get the work out, and tell 'em nothing." This practice extended not only through the management levels, but was also used on the rank and file workers.

Management people, including foremen, felt that they had too much to do to bother with telling a man the "why" and "how" of his job. The training necessary to give him the "how" was done by more experienced miners, and the foreman felt that his job was done when he checked occasionally to see if the new man was working safely and putting out enough effort to satisfy his trainer, who was also generally his buddy. The "why" of the job was generally ignored, with the exceptions of safety and production functions on those occasions when the man needs correction.

This is all pretty much in the past, and

we have, for quite a long time, been stressing the necessity for foremen to tell their men why a thing should be done a given way, and certainly to tell them how as completely as necessary. There is too much positive evidence of the effectiveness of this practice on the attitude and productivity of workers to make it needful to argue for it.

In this, and in many other problems of management, however, the immediate supervisor seems to be an "equine of a different hue." We claim that he is, and should be, looked upon as a source of information and authority by his work crew. To them, he is the company, since most of their contact with management is through him. Yet this man is all too often left without resource just when he needs help the most—when he has a problem he is unable to solve himself. What picture then does the entire management team, the company itself, present to its workers if its management's representative seems to flounder?

When "the heat is on," when the compulsion to perform is generated from above, but no aid is offered in solving an existing problem, the resulting tension can spawn still more problems, many of which are totally unrelated to the original. A keyed-up, apprehensive foreman is certainly in no condition to make the decisions, give the orders and direct the work that his job calls for every minute of his shift. In such a condition he's a constant threat to any achievement he or the company may have made toward labor-management co-operation.

Johnny J., had been section foreman in a conventional loading section for about three years. His record as a foreman was fairly good, but not outstanding. His men liked him and, although he never set any records, he was thorough and cooperative.

In the past month his production had dropped appreciably and his down-time had jumped. This was all because of an unprecedented number of sulphur-balls and bands, breaking bits and chains. Furthermore, three times in the past two weeks he found the cutting machine broken down at the beginning of his shift and all the places cleaned up. This, of course, was shown on his daily production report, but no mention was made

NO ABRASIVE DUST GOES THROUGH THIS STOPER

**LE ROI
S12VT
"DUSTLESS"
STOPER!**



Abrasive dust will never take this fast, hard-hitting stoper out of action! The exclusive Le Roi dust-collecting system enables you to get miles of trouble-free drilling footage in wet, soft, or hard formations. It protects the tool as well as the operator — lowers dust-count well below wet-drilling standards.

The S12VT draws cuttings through 5-hole CRD or Vac-Nu-Matic® bits. Dust is then passed through the hollow drill steel and out the chuck housing — *not through the stoper* — and into the dust box. The powerful suction keeps hole clean for faster, easier drilling — prevents stuck steels regardless of strata conditions.

This amazing "dustless" drill is light — it's easy to use and move. All controls are on the feed leg for convenient operation and greater operator safety.

Check all the features of the S12VT — ask your Le Roi distributor about it today! Or write to Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wisconsin.

**LE ROI
NEWMATIC®
.....
AIR TOOLS**



PORTABLE AND TRACTAIR® AIR COMPRESSORS • STATIONARY AIR COMPRESSORS • AIR TOOLS

Distributed in the Coal Fields by: Acme Machinery Company, Huntington, West Virginia, and Equipment Service Company, Inc., Birmingham, Alabama.

AT-502

Foremen's Forum (Continued)

of it aside from these report entries.

At the last two production meetings, Johnny was singled out for special attention by the superintendent. He was told bluntly to get his production up—or else.

One solution Johnny suggested some time ago was to put a stand-by cutting-machine in or near the section. There was one at the mine, but it had been in the shop for six weeks for a new armature, and, since it was extra it waited on all "rush" jobs. No apparent effort was made to complete it, and Johnny's section was given no assurance that it would be.

Under the pressure and uncertainty of his situation, Johnny's methods with his men changed completely. He became harsh and driving. Small incidents were enough to send him into an angry tirade against the man involved. His one concern was production, and he tried to accomplish it by pressure. He seemed to try to be everywhere at once, but turned out to be nowhere long enough to really concentrate his attention. As a result, ordinary small troubles frequently grew to be bigger ones, compounding his situation.

Yesterday morning Johnny found his places cleaned up again and the cutting machine down. His mechanic got it going in 45 minutes, but at 11:15 it hit a big sulphur band and broke the chain. Johnny was pretty desperate by this time. There were no spare parts, it would take an hour to get them, and he was only a cut ahead of his loading machine.

In the heading there were eight room-necks cut and shot, waiting for the next move. However, they had been used for emergency coal too often and were driven almost too deep to stand without fire-bossing. The mine inspector had noted this and had exacted a promise from the mine foreman that no more coal would be loaded out until a move-up was made. Johnny had been so instructed, but he decided to take a chance. He examined the heading and when his places were cleaned up, he sent his loading machine into it.

He had loaded out two cuts and was on the third when he received word that his cutting machine was operating again. He also heard that the superintendent was coming up to his section. Just then the loader operator, trying to dig tight coal, made a slip and slewed his machine, knocking out a prop that dropped rock on the machine and the helper, who was standing on the tight side. The helper was injured.

Johnny was "caught flat-footed." There is a strong possibility that although he made the necessary safety inspection prior to sending his men into the room-necks, he may have been too agitated to

make a cool and thorough examination. Furthermore, he put not only himself, but his whole company on the spot by disobeying a direct safety restriction of the mine inspector and then getting a man injured as a result.

Johnny was fired, and narrowly escaped prosecution.

Who is really to blame for Johnny's trouble? We can agree that it is management's responsibility to overcome its problems, just as it is management's right to direct the working force. But— isn't it the responsibility of all of the management group that may be involved? A more fundamental question is "Was this problem really Johnny's alone?" Can the manager in the higher rank afford to allow a subordinate to flounder with such problems if it is possible to help him?

How much coal was lost in that period that would not have been lost if Johnny had been confident of his standing? Might the loading machine helper have escaped the suffering and lost income of his injury and the company the record of a lost-time accident if Johnny hadn't been forced to desperation measures? What do the other section-foremen feel they can expect from the superintendent or general foreman when they eventually run into a problem they can't overcome alone? As details of this get around among the workers, how much chance will management have of convincing a promising prospect that he should leave the security of the union and become a foreman?

One of the most common descriptions of the plight of immediate supervisors today is the feeling they have of being deserted while a voice calls from far off, "Everything depends on you." They have also been described as the fulcrum of the industrial see-saw, carrying both management and worker—but equally distant from each. These are, of course, plain exaggerations, but there is still enough truth in them to warrant management's very close attention.

One can recall many old adages eulogizing the "sink-or-swim" idea, and certainly this may be one of the basic tenets of the free enterprise system. But—is the company helping itself to stay afloat by permitting this principle to be applied to the individuals upon whom it depends for existence? Johnny J.'s mistake was not wiped out by his discharge, nor, apparently did anyone learn much of a preventive nature from it.

Certainly we learn best to "do" by "doing." It must also be conceded that too much help creates a variety of unsatisfactory results. Complete dependence, frustration, disgust, or "what's the use",

are only a few. Foremen want the authority and the opportunity to do their jobs so that they may have the satisfaction of achievement. But they also want to know that they can get help when problems arise that their authority or knowledge cannot overcome. For their superiors to adopt a policy completely in either of these two directions creates an imbalance that opposes the very principles that modern management tries to develop.

It suggests the term that industrial psychologists, using it in another context, call "Allness." This is the mistake of the closed mind. If I have once been bitten by a horse, then *all* horses will bite. If I have been cheated by an employer, then *no* employer is to be trusted. It is the basis for much of our religious, national and racial prejudice that we deplore. However, the same fault crops up in other ways with many of us. We are not likely to believe that, since orange juice is good for us, we will live on it exclusively, but many of us apparently find it easy to believe that, since independent action is necessary for development, then we should allow the subordinate to be entirely on his own—until he makes a mistake.

Far too many of the failures of first-line foremen, who should not have failed, are the direct result of such a policy followed by the men above them. Their failures are because of "Mistakes of omission," where they didn't quite know what to do, so did nothing rather than display their inadequacy by asking questions—and because of "mistakes of commission," where they felt compelled to do *something,—anything*, and lacking any advice or aid, they did the wrong thing.

Johnny J. is only one case—but he is multiplied many times. In a time when he job of management is growing ever more complex and demanding the management group cannot afford to leave such a large and varied a segment of itself to grope without help. When top management finds itself confronted with a task beyond its competence it wastes little time seeking necessary information or aid. The foreman problems may be less complex, but to him they are just as unsurmountable when he is left to solve them alone on the resource of only his own experience. The man who makes repetitive mistakes is another matter, but for foremen who have demonstrated that they can, and, want to, learn, then all the resources of the management team with which they work should be used to make it possible to overcome their difficulties. Otherwise, management can little wonder why foremen doubt their security and their status.

Special fastener does it better at half the cost



OLD BOLT

The sleeve-type bolt was used as a steel strapping handle for railroad cars. Not only was the weld expensive, but the part had inadequate strength for the holding of heavier loads.



NEW BOLT

Bethlehem fastener engineers designed this forged-eye bolt. A greatly increased strength resulted from both the new design and the use of a heavier material . . .
at half the cost of the old style bolt!

Our ability to redesign fasteners is just one example of how our fastener engineers can study your problem. Perhaps a minor change—or a completely different design—can do your job better . . . and at lower cost. Bethlehem makes just about every type of steel fastener specialty—forgings, rods, bolts, nuts, and stampings.

Just send us a rough pencil sketch or drawing of the part you need, indicating dimensions. After our fasteners engi-

neers have studied it, we'll give you our honest appraisal of what we can do for you. If we can't recommend a practical solution, we'll say so. But if we can help you, and you are fully satisfied with our estimate, we're prepared to give you fast delivery. Just phone our nearest sales office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

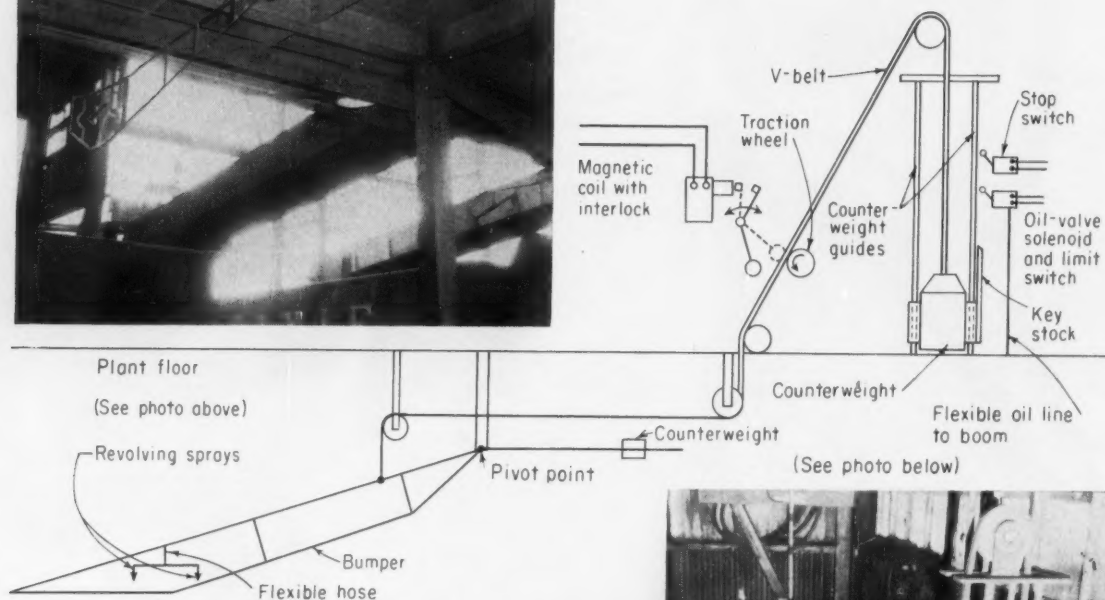
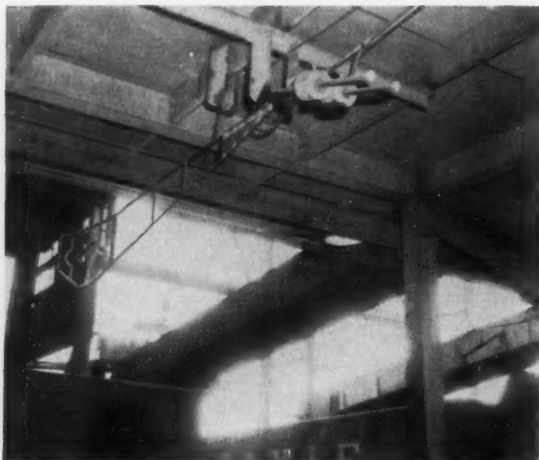


for strength
... economy
... eye-appeal

BETHLEHEM STEEL



Operating Ideas



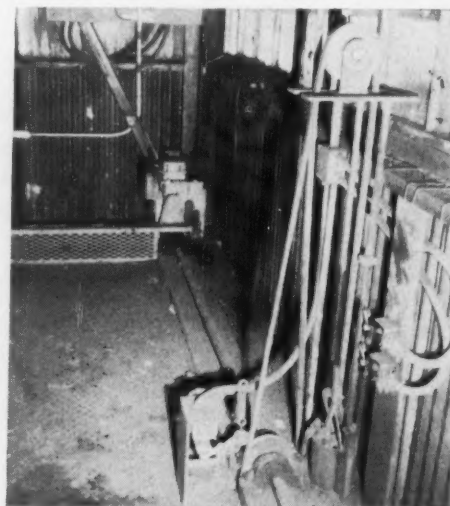
PUSHBUTTON at loading-point operator's station controls up and down movement of boom and flow of oil to two garden-type rotating sprays on boom. Sprays deliver uniform oil coat to sides and bottom of car.

Pushbutton Car Freezeproofing

FREEZEPROOFING to prevent coal from sticking to the bottom and sides of the railroad car is now done by pushbutton at Peabody Coal Co.'s Vogue Mine, Madisonville Ky. To spread a uniform coating of oil onto the interior of railroad cars on any of the five loading tracks the loading-point operator merely pushes buttons on his control board. This simple action automatically lowers an oil spray boom into the car, starts and stops the flow of oil at predetermined positions and returns the spray boom to its original position when a car is coated.

Two ordinary lawn-type rotating sprays mounted on the boom do an excellent job of coating the cars, according to mine management. Installed in the Vogue plant in November, 1959, the system was originally designed and built by Rex Reid, tippie foreman, for use at Peabody's White City plant.

As a railroad car moves into position on one of the loading tracks, the loading-point operator presses a button that engages a magnetic coil with an interlock. This interlock moves an idler arm against a V belt, pushing it against a rotating traction wheel. One end of the V belt leads to the spray boom and the other to a counterweight. As the spray boom goes down into



the car, the counterweight rises. When the spray boom is in the proper position a piece of key stock welded to the counterweight engages a limit switch controlling a solenoid-opened oil valve, thus starting the flow of oil to the sprays.

The oil continues to flow until the key stock engages a stop switch, which disengages the magnetic coil that was energized by the loading-point operator to start the spray system. The counterweight thus is free to drop down toward its original position. But as soon as the key stock on the counterweight drops below the limit switches, the magnetic coil is reenergized and the cycle is repeated. Thus the oil sprays on the boom are moving up and down, spraying oil continuously on the car below. The operator pushes a second button to stop the system when a car is coated.



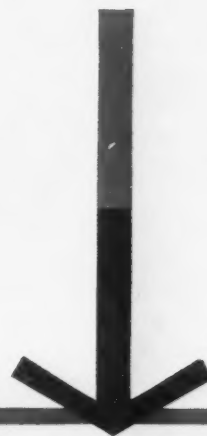
HOW TO HANDLE 90 FEET OF OVERBURDEN

The first problem in dealing with 90-foot overburden is to pick it up in meaningful bites. The next problem is to stack it high enough and far enough away to keep it from rolling back into the pit.

The 35 yard bucket and 220 foot boom of the Marion 7800 Walking Dragline provide sound, proved answers for both problems.

Here it is demonstrating its accomplishments in a Canadian mine where it is credited with cutting stripping time by one half to two thirds.

Whatever your stripping problem, there is a Marion machine of the type, size and capacity to assure fast handling at low unit costs.



**CONSULT MARION
MINING SPECIALISTS**

for lowest costs
on your property!

MARION POWER SHOVEL COMPANY • Marion, Ohio, U.S.A.
A Division of Universal Marion Corporation

Operating Ideas (Continued)



Special Platforms Make Truck Maintenance Safer

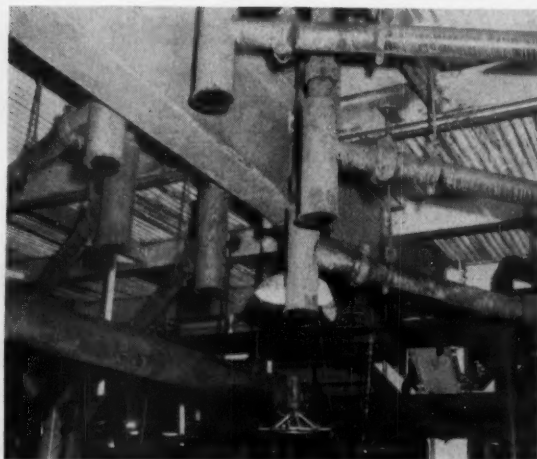
SMALL SHOP-MADE multiple-level working platforms provide a safe, nonskid footing for mechanics working on big coal haulers at the Truax-Traer Coal Co. Little Sister Mine, St. David, Ill. With the aid of a platform a mechanic can work on an engine without crawling over wet, slippery tires or bumpers. As a consequence he is able to complete a job faster and without the fear of slipping.

Made from scrap $\frac{3}{4}$ -in pipe and pieces of shaker screen salvaged from the preparation plant, the platforms were assembled at virtually no labor cost during "filling" time.

Elbowless Pipe Turns

ELIMINATION of conventional elbows in pipelines carrying raw fine coal from distributors to washing tables helps reduce maintenance costs at U. S. Steel's Maple Creek preparation plant, New Eagle, Pa. In place of conventional elbows the plant uses T-shaped connectors which are joined to grooveless pipe with threadless couplings. Management notes that the threadless couplings will make it possible to rotate the feed pipes and thereby prolong their length of service.

The T connectors last longer than a regular pipe elbow because solids build up in the closed lower part of the fitting and prevent the flowing solids from coming in contact with metal. Once the initial buildup is made the slurry continues to flow unrestricted. Leading from the T connectors to the wet washing tables are standard pipes with uniform length and slope. This arrangement provides as uniform a feed as possible to the tables.



Small-Parts Truck Aids Pit Maintenance

A RADIO-EQUIPPED panel truck carrying an assortment of frequently needed small parts and assorted tools helps speed minor repairs at the Truax-Traer Coal Co., Fiat, Ill. A roving mechanic, based at the main truck garage, uses the truck to speed to the pit when alerted by radio from one of the stripping units. Since the truck is always stocked with spare parts and tools, the mechanic does not spend valuable time gathering materials and tools before heading to the unit in trouble.

There is also room in the truck for carrying larger parts and extra tools not normally included in the truck inventory. It carries a sparkplug-type compressor attachment for filling tires in the field and has a coupler for towing a portable welder. In addition to serving as a maintenance truck, the unit hauls drilling and shooting crews to and from the pit.

"Step Up" Screening Capacity with CASCADE "STEP" CONSTRUCTION!



Now you can almost double your small coal screening capacity and eliminate flooding caused by overloads. Hendrick's new Wedge Wire CASCADE Screen has a special "step" construction that breaks up the flow layer and causes a tumbling action to greatly improve dewatering efficiency.

CASCADE increases draining to such an extent that you can use smaller screens to achieve the same throughput as before and save on space and material costs. Hendrick Wedge Wire CASCADE Screens are furnished with openings from $\frac{1}{4}$ to 1 m.m., in anti-

corrosive stainless steel. For more information, mail in the coupon today!

HENDRICK Manufacturing Company

41 Dundall Street, Carbondale, Penna.

Gentlemen: I am interested in learning more about Wedge Wire CASCADE Screens.

- ☐ Please send me FREE booklet.
☐ Please have representative call.

Name _____ Title _____

Company _____

Street _____

City _____ State _____

PERFORATED METAL SCREENS • WEDGE WIRE SCREENS • CASCADE WEDGE WIRE SCREENS • WEDGE SLOT SCREENS • RUBBER CLAD PERFORATED SCREENS
FLANGED LIP SCREENS • FLIGHTS • SHAKER AND CONVEYOR TROUGHs

Equipment Developments



New Walking Dragline and Bucket

Latest developments at Page Engineering Co., Chicago 38, include this diesel walking dragline (left), which Page says is the world's largest, and a "Dual Hitch" automatic dragline bucket (right). Page built the giant walking dragline,

Model 732, for the Hoffman Coal Co., Karthaus, Pa., says it has the only diesel engines, twin V-6's, especially engineered and developed by the firm for dragline machines. The 732 has a 200-ft boom and is seen swinging a 16-cu yd "Dual

Hitch Automatic." The bucket, called a "first" by the firm, is said to introduce a completely new concept in dragline digging, all-purpose, all depth, uniform digging, resulting in lower cost and greater productivity.

"Hazardproof-Carcass" Belt

Bostrom, described as "the belt with the hazardproof carcass," is now offered for all types of service by the Boston Woven Hose & Rubber Co., Div. of American Biltrite Rubber Co., P. O. Box 1071, Boston 3, Mass. Use of special synthetic fibers in the carcass is cited as the major reason for long life and low operating costs. As a result Bostrom belts are completely resistant to the effects of moisture. They are said to be superior in ability to withstand impact without carcass rupture, as well as localized stresses from pulley buildup and poor loading.

Fatigue resistance when flexing over small pulleys, and in the fastener area, is high. "No failures of a mechanical splice from fatigue" have been encountered in 3 yr of field evaluation. Resistance to most chemicals, rust and the like is good.

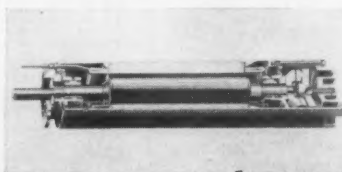
Ply construction is employed, and the company notes that the manufacturing process assures equal ply stress for greater belt life. Fewer plies, resulting in a thinner, lighter belt, is a result of "a unique use of heavy skins between the plies." Handling, storage and instal-

lation are easier, headroom is reduced and pulley diameters can be cut up to one-third. The Dulon cover, the company points out, is a very tough resilient compound with maximum abrasion, cutting, tearing and aging resistance. A treated nylon leno breaker strip is provided for "exceptional resistance to impact and cover and edge tearing."

Assuming a 30-in belt handling 6x0 material at 100 lb per cu ft and minimum tension requirement of 300 lb per in of belt width, Boston offers the following comparison of its Bostrom 90 2-ply

belt and an ordinary 5-ply type of belt:

	Bostrom 90 2-Ply	Conven- tional 5-Ply
Vulcanized splice rating, per in of width, lb.	300	300
Wt per ft, lb.	5.92	8.09
Belt thickness, including covers, in.	0.385	0.552
Minimum pulley dia., in:		
Head drive.	20	36
Tail.	16	30
Takeup.	16	30
Low-tension snub.	12	24
Wt. 500-ft roll, lb. .	2,950	4,000
Dia., ft-in.	4-10	5-9



NEW TURBINE PUMP—New water-cooled, water-lubricated motors rated from 30 to 250 hp, three phase, 60 cycle, 1,800 rpm for 10-in or larger well casings are now available from Westinghouse

Electric Corp., Pittsburgh 30. The motors can be continuously submerged in water at a maximum temperature of 40 C for deep wells, booster or process applications. With water as the cooling and lubricating agent, bulk and hard-to-maintain pressure systems are eliminated, notes the firm. Extra-large water filters prevent invasion of foreign matter and Kingsburg-type thrust bearings in the motors withstand more than twice the load of bearings in conventional submersible motors, states Westinghouse.

There's no easier drill to run than a **REICHdrill!**

*This smooth operating,
all-hydraulic rotary rig
is helping REICHdrillers
get core samples faster.*

In coring and prospecting there's no easier drill to run than a REICHdrill. And the key to money-making drilling records is a simplified control "console". From it, every move required by an experienced driller... every decision he makes... is converted smoothly, instantly, by the all-hydraulic system, into positive, time-saving performance.

Hydraulic drive to drill stem eliminates power loss... transmission troubles... kelly and rotary table.

Vari-speed Hydraulic Drill Control gives the operator the right combination of rotary speed and feed pressure for every formation. Lever actuated head retracts hydraulically for fast core recovery with wire-line equipment.

Other features: fast, easy set-ups; instant safety torque release to protect all drive components... save rotary and diamond bits, core barrels and drill steel. *You get more from your rotary when it's a REICHdrill!*

REICHdriller at control "console" has every rig maneuver in sight... every rig control in reach.

For further information write:



REICHdrill

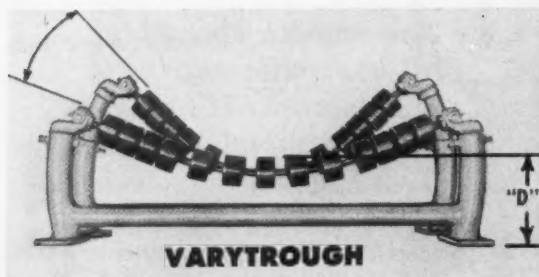
1442 BEECH ST., TERRE HAUTE, IND.

Division: CHICAGO PNEUMATIC TOOL CO.



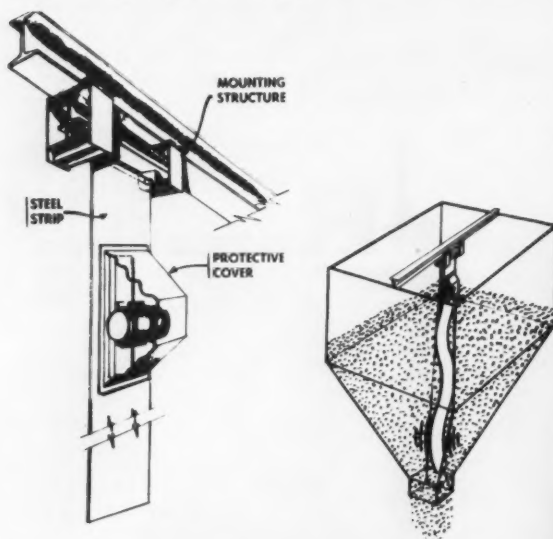
Model T-400 REICHdrill, specially designed for coring, has 12-foot continuous stroke. Down pressure to 10,000 pounds. Can drill up to 6" diameter holes, and take cores from more than 3,000 feet.

Equipment Developments (Continued)



Adjustable Belt-Idler Bracket

By using its new adjustable "Limberoller" bracket, reports Florida Conveyor & Equipment Co., Mulberry, Fla., you can control spillage and increase the capacity of your conveyor systems over 25% without expensive belt construction or the disadvantages of steel rolls at steep angles. The special bracket adjusts from 20 to 40 deg, permitting variations in the troughing angle. Benefits are said to include: elimination of "jiggling" and premature cable failures by assuring uniform contact of idler and belt; elimination of skirting grooves in the belt by making possible a parallel and same-angle "perfect mating" of the belt and the skirt boards; and elimination of spillage and wandering belts due to off-center loads, through its adjustability to deep troughs at loading points.



Internal Bunker Vibrators

Constant, free-flowing materials from huge wood, steel or concrete bunkers can be assured by use of its new internal bunker vibrators, reports Syntrol Co., Homer City, Pa. The unit consists of a powerful electromechanical rotary vibrator mounted at the top of a long strip of steel. It is suspended down into the bunker, directly over the discharge opening. In operation the vibrator causes the steel strip to undulate violently, breaking down arching and plugging. The unit is furnished complete with the mounting structure supporting a 5-ft strip of steel, 18 to 24 in wide, on which is mounted the rotary vibrator. Additional lengths of strip steel can be welded to the unit to make up to a maximum length of 50 ft. Units are 220 or 440, three-phase, 60 cycle, AC.



Extended Life for Dryer Plates

Laubenstein Mfg. Co., Ashland, Pa., working with Jones & Laughlin Steel Corp., Pittsburgh 30, has produced a tougher coal-dryer plate said to better withstand constant abrasive action found in coal drying. The dryer plate, which takes an abrasive pounding from coal being dried in centrifugal machines, requires a great deal of time-consuming maintenance, it is noted. To extend the brief life span of the plates, an average of 120 hr, according to the firms, Laubenstein and J&L switched from mild steel to a higher-carbon rolled sheet. The perforated plates, known as Laub M dryer sheets, are tougher and more durable with increases in life span reported up to 50%. Sheets vary in thickness from 14 to 22 gage. Diameter of the perforations range from 1 mm to $\frac{3}{32}$ in.



Bigger Payloads

An aluminum dump-trailer made by Ravens-Metal Products, Inc., Parkersburg, W. Va., is said to carry 10,000 lb more payload than conventional steel units. Weighing only 10,900 lb, the unit's efficiency and capacity is the result of three factors: tri-axle suspension with 12 tires; all-aluminum 34-cu yd capacity box; and all-aluminum frame. The box of a typical Ravens unit is 27 ft long with 56-in high sides. The frame is 31 ft by 18½ in deep. The floor is of $\frac{3}{16}$ -in plate and the sides of $\frac{1}{2}$ -in plate. Dumping is achieved by a commercial hoist, 9-in diameter by 22-in stroke.

B.F. Goodrich



B.F. Goodrich tires haul 50 tons of coal over limestone roads

CENTRAL OHIO COAL COMPANY owns and operates the Muskingum strip mine in southeastern Ohio. Monthly production averages 200,000 tons of coal, carried from mine to dump by giant haulers. The one above carries 50 tons on the 8-mile trip over roads topped with crushed limestone.

There's a job for the toughest tires available—B.F. Goodrich Rock Service tires. They're built with either the new BFG Cut Protected compound (defies rock cuts and snags), the Heat Resistant compound (resists heat build-up) or the Regular compound.

And the B.F. Goodrich FLEX-RITE NYLON cord body withstands double the impact of ordinary materials. It resists such tire-killers as heat blow-outs and flex breaks. Result: more retreadable Rock Service tires and more retreads per tire!

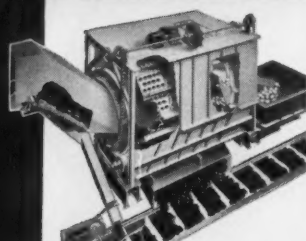
Take a tip from successful mine operators—call your B.F. Goodrich Smileage dealer today. He is listed under Tires in the Yellow Pages of your phone book. He has a complete line of money-saving B.F. Goodrich tires for every type of mine work. *The B.F. Goodrich Company, Akron 18, O.*

Specify B.F. Goodrich Tubeless or tube-type tires when ordering new equipment



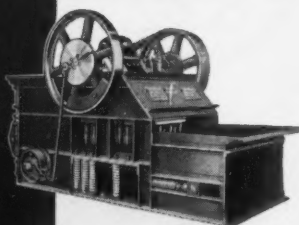
B.F. Goodrich *off-the-road tires*

America's most complete line of CRUSHING EQUIPMENT



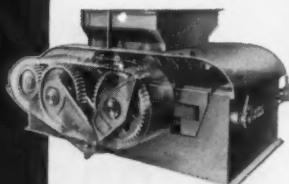
**McNally Pittsburg
Rotary Breaker**

This unit allows positive control of top size in handling run-of-mine washery feed. Production of fines is held to a minimum.

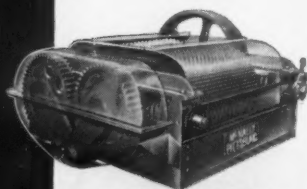


**McNally Norton Vertical
Pick Breaker**

50% Less fines when reducing lump to egg and stove sizes.

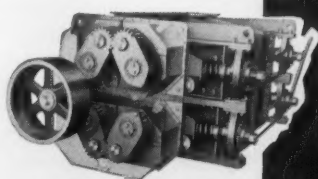


**McNally Double Roll
Gearmatic ROM Breaker**
Built in tonnage ranges from 750 tph to 1400 tph. Full floating gearmatic drive.



**McNally Gearmatic Stoker
Coal Crusher**

This unit offers three prime advantages: high volume production, plus accurate sizing, plus low percentage of fines.



McNally Two Stage Crusher
This unit consists of a double roll primary crusher mounted above a double roll secondary crusher—compactly arranged into a single rigid structure.

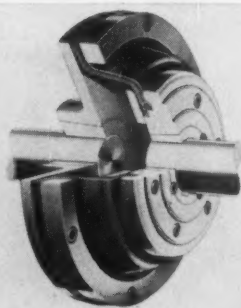
Available From Stock and on Short Delivery
For immediate action on complete information write,
wire, or call

McNALLY PITTSBURG MFG. CORP.

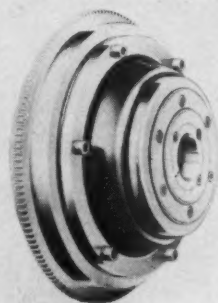
Pittsburg, Kansas

Wellston, Ohio

Equipment News (Continued)



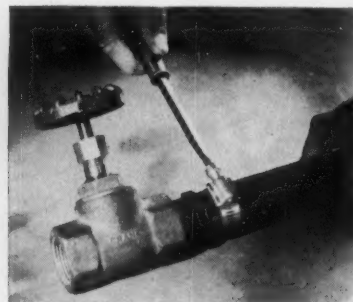
HIGH SPEED (PH)



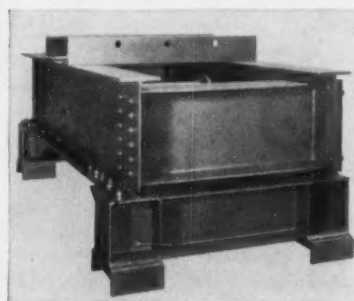
FLYWHEEL (PF)

FLEXIBLE COUPLINGS—A pan-shaped rubber flexing element of entirely new design is the feature of two new cushion-type couplings for high speed or high torque applications by Dodge Mfg. Corp., Mishawaka, Ind. Called "Para-flex High Speed" and "Para-flex Flywheel Type," they were designed to operate at high speeds and transmit greater torque than the original "Standard" Para-flex with a rubber tire-shaped flexing member of cord and rubber construction, announced by Dodge in 1957. The high-speed unit consists of the flexible member supported

on one side by a clamp-ring flange like those furnished with the tire-type coupling and with its larger side bolted to a steel disc. It may be used with electric motors or internal combustion engines to operate such equipment as compressors, pumps or high-speed fans. The fly wheel type is like the high-speed unit except that its larger side bolts directly to the flywheel of an internal combustion engine instead of being supported by a steel disc.



PLASTIC PIPE—Crane Co., Chicago 5, is marketing a new line of plastic pipe and insert fittings. The pipe is made of high density polyethylene and the fittings of polypropylene. Trademarked Poly III, the pipe comes in sizes of 1/2 through 2 in and has 50-yr life expectancy. Because of simplicity of installation, says the firm, one man with only three basic tools can install the pipe. The polypropylene resin fittings are said to assure leak-proof connections, easy installation and long life.



STREAMLINED SHAKER—Allis-Chalmers Mfg. Co., Milwaukee 1, has streamlined its 3 1/2-ton car shaker by fitting its self-contained completely-sealed two-bearing mechanism in the nodular iron housing within the body. The mechanism has a short center V-belt drive and 10-hp high starting torque motor, and is easy to get at by removing one side plate. The motor is isolated by four rubber mountings which are bolted to the body. Grease fittings at each end of the mechanism are accessible from above and lift beams are drilled to accommodate single or twin-hook hoists. The shaker body has extra-long wide-faced shoes to fit any standard U. S. hopper-bottom gondola car and is



introduces revolutionary "Plasticoal"

The first and only PVC yarn-dipped, fully impregnated, double-woven coal mine belt with durability more than skin deep

All the disadvantages of short life, slippage, stretching and rotting of conventional light-weight coal mine belts have been overcome by the revolutionary Thermoid-Quaker "Plasticoal" belt.

In contrast to conventional double-woven cotton fabric covered with neoprene, new "Plasticoal" is impregnated through and through with Polyvinyl Chloride . . . even the yarn is PVC dipped before it is woven. Nylon cords are added, in both directions, to provide extra strength and the entire impregnated carcass is heat-set under tension before the final dip and heat-set.

For underground mine safety, USBM 28-11 "Plasticoal"

is flame retardant and flame resistant. It's lighter in weight and more flexible for ease of handling underground. The rough surfaces give better material traction, less slippage, yet require less tension. And being completely impregnated with PVC, the "Plasticoal" carcass carries the load long after the cover is worn away. Even extreme edge wear will not put "Plasticoal" out of commission.

Mine-orange "Plasticoal" is available from stock in 26", 30" and 36" widths, up to 600' lengths or longer on request. See your Thermoid Division Distributor for all the advantages of new "Plasticoal." Or write *Thermoid Division, H. K. Porter Company, Inc., 200 Whitehead Road, Trenton 6, New Jersey.*

THERMOID DIVISION



H.K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

A Typical Day with a Hercules Representative



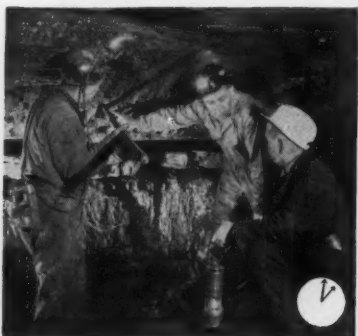
AN EARLY START enables Bob Shiel, Hercules technical serviceman, to observe step-by-step blasting procedures at his customer's mine.



CLOSE CONTACT between Bob and the mine superintendent eliminates most blasting troubles, and increases the operating economy of the mine.



UNDERGROUND with the tools of the trade, Bob examines some of the cars of blasted material to determine the effectiveness of the explosive charges.



BLASTING-PROCEDURE observation is a part of Bob's work. It takes the guesswork out of his job, and enables him to specify the proper explosives.



SHOP TALK helps find out if the remedy he's suggested has cured this mine's troubles. Bob's background gives him the insight necessary to make intelligent recommendations.



CHECKING and rechecking all the recommendations he has made gives Bob the satisfaction of knowing that he has been of assistance in solving his customer's blasting troubles.

Around the nation — around the clock THERE'S ALWAYS A HERCULES MAN READY TO HELP YOU

Bob Shiel, E.M., Ohio State, is just one of the many specially trained Hercules men serving the explosives-consuming industries. For years Hercules has employed men with engineering training to sell and service its explosives throughout the United States and in many foreign lands. Our experience has proved that men with engineering training can meet their customers on common ground. They speak the same

language, for most of the men who direct explosives-consuming work are technically trained.

When a young engineer starts his training as an explosives sales engineer with Hercules, he begins a period of orientation. He is then sent to our explosives plants and laboratories for thorough groundwork in products and processes. Upon completion of this indoctrination, he visits various sec-

tions of the country where he learns how explosives are used in underground and open-pit mines, rock quarries, heavy-construction jobs, and seismic exploration.

The cornerstone of Hercules Explosives Department is based on men who have the know-how to handle blasting problems quickly, efficiently, economically. To take advantage of this specialized service, call or write.



Explosives Department
HERCULES POWDER COMPANY

INCORPORATED
Hercules Tower
910 Market Street
Wilmington 99, Delaware



BIRMINGHAM, ALABAMA • CHICAGO, ILLINOIS • DULUTH, MINNESOTA • JOPLIN, MISSOURI • LOS ANGELES, CALIFORNIA • NEW YORK, NEW YORK
PITTSBURGH, PENNSYLVANIA • SALT LAKE CITY, UTAH • SAN FRANCISCO, CALIFORNIA

PYROPRENE*

*Acceptance designation: "Fire Resistant, U.S.B.M. No. 28-7"

Here's one overhead that runs up big profits

This Acme-Hamilton 48-in. conveyor belt, on a Goodman Rope-belt Conveyor is carrying coal at 1500 tph with low maintenance costs and long service life. Note how nicely the belt troughs under the bulky load—and how flat it runs between the return idlers... sure signs of excellent construction and fine quality.

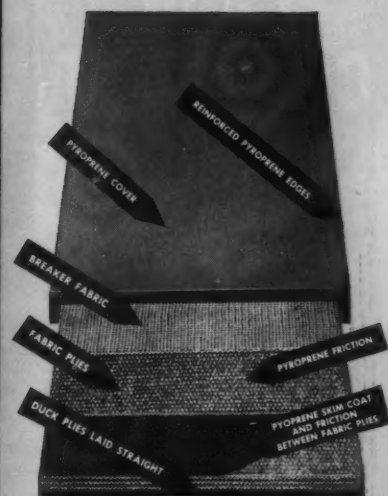
PYROPRENE PROTECTED against fire, Acme-Hamilton U.S.B.M. accepted belts will not feed or spread fire. The cover is fire-resistant Pyroprene; fabric plies and breaker fabric are encased with Pyroprene compound before the belt is built. Cover has exceptional resistance to abrasion and cutting. Write Acme-Hamilton Dept. CA-91.

Acme  **Hamilton**

MANUFACTURING CORPORATION, TRENTON 3, N. J.

Divisions: Acme Rubber Mfg. Co. • Hamilton Rubber Mfg. Corp.

ATLANTA • CHICAGO • DETROIT • HOUSTON • INDIANAPOLIS • LOS ANGELES
MILWAUKEE • NEW YORK • PITTSBURGH • SALT LAKE CITY • SAN FRANCISCO • SEATTLE



*Puts the Air
There!*

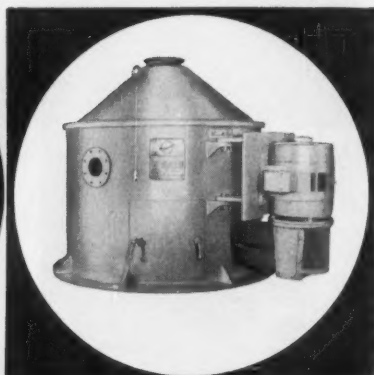


ABC MineVent

Flexible Ventilation Tubing
Easy to hang. Easy to couple. Hard to wear out. 8" to 36" diameters. Also Wire Reinforced Tubing. Send for Catalog.

AMERICAN BRATTICE CLOTH CORPORATION
200 Argonne Rd.
Warsaw, Indiana

**THE
C·M·I
COMPACT
26**



**NEWEST ADDITION TO THE CMI LINE
OF CONTINUOUS CENTRIFUGAL DRYERS**

The all new CMI Compact 26 is the first compact dryer for moderate requirements; the first compact dryer specifically

made for a capacity of 20 tons per hour or less of coal or minerals; the first compact at a modest price.

Send for Bulletin 26 which contains complete information.

CMI

CENTRIFUGAL & MECHANICAL INDUSTRIES, INC.

146 PRESIDENT STREET • ST. LOUIS 18, MISSOURI

Equipment News (Continued)

balanced to hang level to facilitate centering on car eaves.

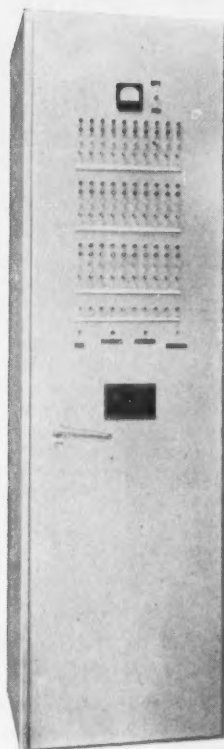


EXHAUSTING FUMES—For any shop or work where smoke and fumes in a closed area are a problem, such as welding (photo), the "Flex Air Mover" may be the answer, declares the manufacturer, Arcair Co., Lancaster, Ohio. The unit has a special intake nozzle joined to a jet jump casting by a length of flexible tubing. From this point smoke is carried out through another connecting section of tubing to any discharge point. Powered by compressed air, the unit eliminates need for heavy or space-consuming electric motors, says the firm. Additional lengths of tubing may be added with no reduction in effectiveness. Operation requires merely connecting it to an air line positioned to carry the smoke and fumes away from the work area, with the intake near the source.



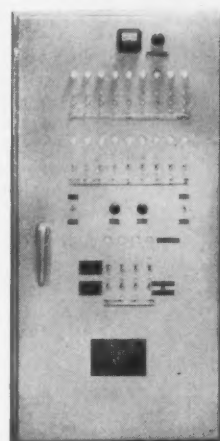
COMMUNICATION—General Electric's Communication Products Dept., Lynchburg, Va., has a new 10-W speaker for use with its transistorized Progress line of two-way radio equipment. The firm reports the unit uses 90% less battery power than a typical transistorized 5-W unit while delivering twice as much audio. Weighing only a little over 3 lb, the equipment detaches easily from mounting brackets on the dash of a car and may be hung on the window so messages may be heard outside the vehicle.

LARGE MINES



10 FANS
30 CIRCUIT BREAKERS

small mines



4 FANS
14 CIRCUIT BREAKERS

There's a FEMCO 709 system to meet your needs

Fan-actuated power shut-off plus centralized monitoring and remote control over a single pair of wires

No matter how many fans and circuit breakers . . . no matter what distances are involved . . . no matter where the power comes from, there is a 709 system which will provide these services:

1. Automatic shut-off of power going into the mine in the event of fan failure.
2. Centralized monitoring of all fans and circuit breakers.
3. Selective remote control of all circuit breakers and, if desired, of all fans.

The heart of this system is the Femco Circuit Scanner. Essentially, this is a synchronous commutator using hermetically sealed reed switches instead of sliding contacts.

A rugged clock motor drives a rotating arm on which is mounted a permanent magnet. As the arm passes each switch, the magnet closes that switch. The circuit thus established is maintained long enough to permit transmission of an indication from the field station and, if desired, a control impulse from the central station.

Scanners are located at each field station and at the central control station. Special circuits keep all scanners in synchronism. Since the scanner motors operate continuously, no extra starting circuits are necessary, thus simplifying the system and keeping costs down.

We will be glad to send you further information, or to discuss the Femco 709 system as it applies to your specific situation. Just write or call FEMCO, INC., IRWIN, PA.

A-202

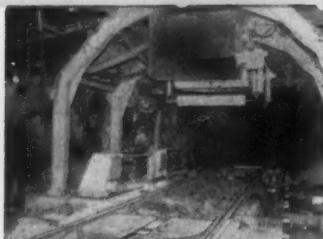
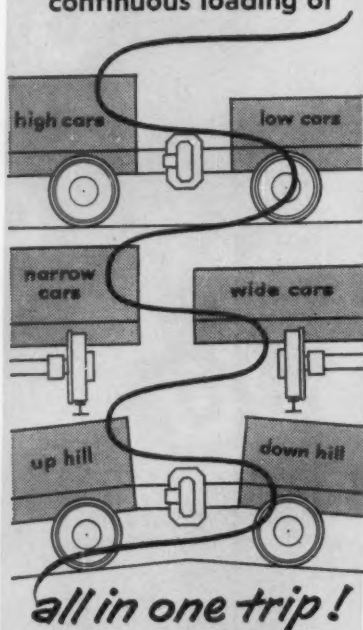
Femco

COMMUNICATIONS: Carrier and wired audio systems for all mining and industrial applications. **MONITORING:** Fans, circuit breakers, valves, pumps, compressors, etc. **TELEMETERING:** Flows, pressures and other functions. **REMOTE CONTROL:** Pumps, valves, circuit breakers, soaking pit covers, furnace doors, cranes, or other moving equipment.

NOLAN

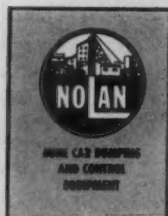
AUTOMATIC LOADING STATION

assures positive
continuous loading of



NOLAN Automatic Loading Station (at top)
with NOLAN Hold-a-trip in distance

No stopping—no stalling
No tipping—no derailing



Let us tell you and show
you why the Nolan Auto-
matic Loading Station is
better engineered and in-
cludes safety features for
every operating condition

**WRITE FOR
FREE
CATALOG**

NOLAN Sales Agents

George C. Hutchinson, Jr., 800 Kennan Building, Pitts-
burgh, Pa.
Huntington Supply & Equipment Co., 423 First Huntington
Nat'l Bank Bldg., Huntington, W. Va.
E. C. Horne Machinery Co., 1726 Champa Street, Denver
2, Colorado
Frank C. Hammett, P.O. Box 154, Castle Gate, Utah
J. L. Thomas, 429 South 24th Street, Birmingham 5,
Alabama
John North Associates, P.O. Box 105, Warbert, Mich.
(Chicago District)
Levitt Safety Limited, Toronto 10, Canada

Write us now!

THE NOLAN COMPANY
106 Pennsylvania St. Bowerston, Ohio

Equipment News (Continued)

The speaker provides higher sound level
in places where high noise level is a prob-
lem.

TOUGHER BELT—Improved toughness
and durability are qualities of improved
conveyor belting for underground coal
mining, announced by Thermoid Div.,
H. K. Porter Co., Inc., Trenton, N. J.
Every strand of yarn in the new "Plasti-
coal" belt is dipped in Polyvinyl Chloride
before the belt is woven and impreg-
nated, giving it a ruggedness that re-
duces widely the need to replace belts
because of abrasion and tearing, says
the company. The belt's rough corrugated
cover is formed by dipping the carcass
into PVC tanks, and double nylon cords
as well as cotton cords are woven
through the belt for greater strength.
Orange in color for better visibility,
Plastical is flame retardant and resistant
and approved under U. S. Bureau of
Mine safety specifications. It comes in
widths of 26, 30 and 36 in and in lengths
to 600 ft.



HARDENING ROLLERS—A roller flange
flame hardener designed to increase the
hardness of rebuilt tractor rollers and so
prevent flange roll-over is a product of
Victor Equipment Co., San Francisco 7.
Roll-over, declares the firm, causes most
premature failures of rebuilt flanges. The
new machine hardens the renewed area
to about 50 Rockwell C. Dual torches
enable it to flame harden both the in-
side and outside of the roller simultane-
ously, thus preventing distortion.

IMPROVED ROOF BOLT—"W"-Hole-
grip, an improved roof bolt from Con-
nors Steel Div., H. K. Porter Co., Inc.,
Birmingham, Ala., features a locking key-
hole plate, new bolt head design and
a unique spring bail. The bolt assem-
bly is said to be trouble free because
a smaller hole in the bottom of the shell
provides snugness and prevents bolt
wobble when the unit is inserted in
place. Because the bolt and plug remain
aligned, possible stripping of threads
is eliminated. The bail, which eliminates

Newly Published...

"MINE EXAMINATION REPORTS AND VALUATIONS"

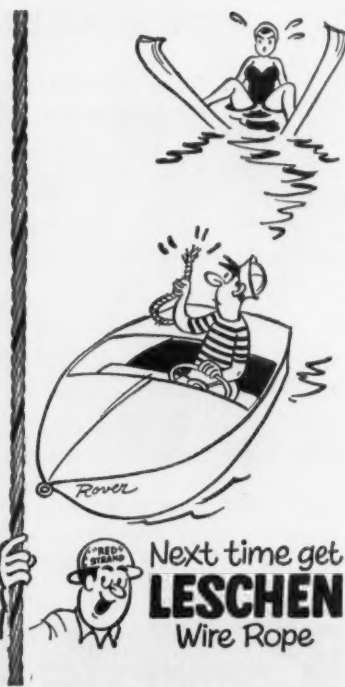
A NEW BOOK "Mine Examination
Reports and Valuations" by Dr.
James H. Pierce, Board Chairman of
Pierce Management Corporation, and
Thomas F. Kennedy, Consulting Min-
ing Engineer, is the first authentic
American book which completely covers
all phases of coal mine valuation and
the duties of the examining engineer.

Included in this book are chapters
on Qualifications of the Engineer, Scope
and Form of Examination, Coal
Sampling, Water Studies, Production
Costs, Economic Consideration, Valua-
tion Principles, plus formulas and tables
and illustrative examples of applying
valuation formulas.

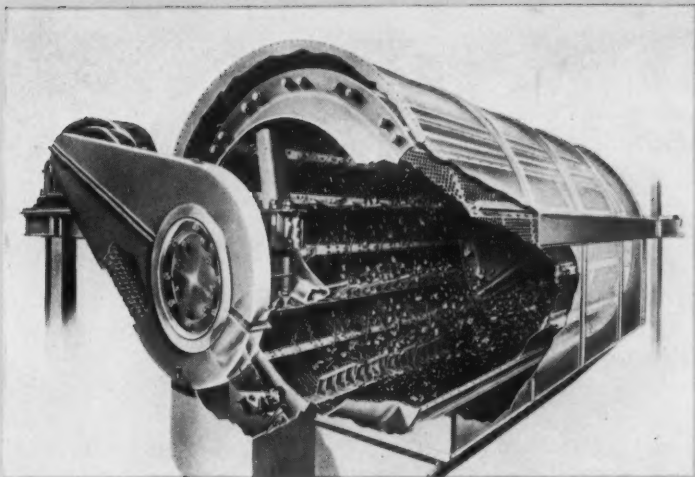
It is our judgment that this book
will be used as an authority for many
years by engineers, accountants and
lawyers.

\$10.00 per copy

Pierce Management Corporation
P. P. & L. Building
Scranton 3, Pennsylvania



LESCHEN WIRE ROPE DIVISION
H. K. PORTER COMPANY, INC.



PENNSYLVANIA BRADFORD BREAKERS prepare over 160 million tons of coal each year

Because no other coal processing machine does so much for so little—Pennsylvania Bradford Breakers have become a standard of the industry.

At power plants, by-product coke plants, coal mines and coal cleaning plants Pennsylvania Bradfords clean, size and scavenge at phenomenal low cost.

Data from 10 installations over 8 years shows an average maintenance cost of \$.001 per ton, and an average power consumption of .204 KW per ton.

TRIPLE ACTION

Continuously charged, the Pennsylvania Bradford immediately

screens out passing sizes of coal through the screen plates. Larger lumps are raised and dropped, breaking by gravity impact until they are screened. All refuse—sulphur balls, slate, rock, tramp iron, etc.—resist breakage and travel the full length of the breaker where they are discharged.

BRADFORD-HAMMERMILLS

For reduction of particularly hard coals and for heavier loading, Bradford-Hammermills are frequently specified. This machine combines a concentrically-mounted rotor of a hard-hitting Pennsylvania Hammermill at the rear end of the slow speed Bradford Breaker. Capacities are increased over 20%.

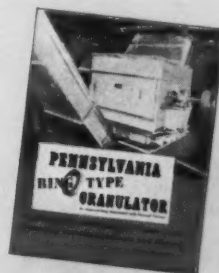
← Pennsylvania Bradford crushes, sizes, scavenges all in one operation—at lowest cost

FREE BULLETIN

For the full story on Pennsylvania Bradford Breakers and Bradford-Hammermills write for Bulletin 3007.

RING-TYPE GRANULATORS

For preparing coals for stoker and pulverizer fuel, and other uses where overgrinding is undesirable, Pennsylvania Ring-type Granulators have no peer. Exclusive design; exclusive advantages. Completely described in Bulletin 9002. Send for it.



PENNSYLVANIA CRUSHER DIVISION

BATH IRON WORKS CORPORATION
WEST CHESTER, PENNA.

★ ★ ★

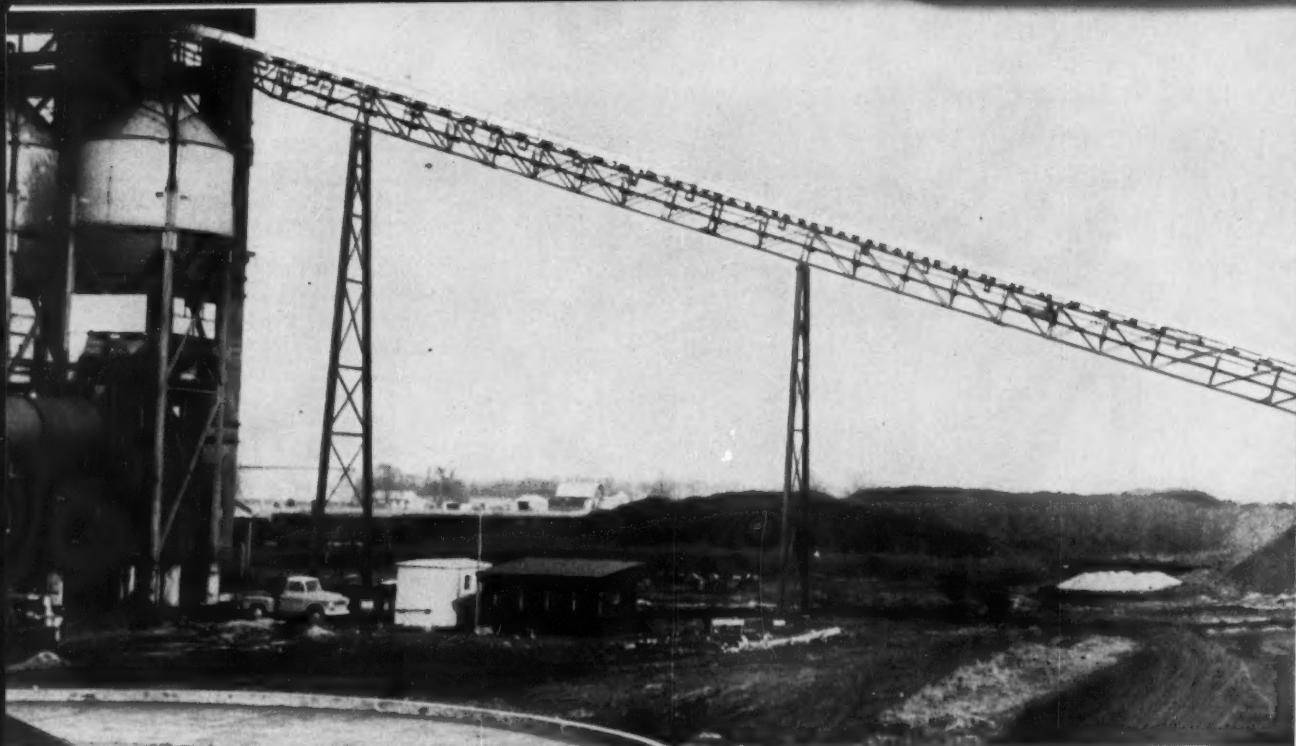
Over 50 years concentrated experience in all types of material reduction makes Pennsylvania your best source of crushers and engineering advice and service. Call on Pennsylvania with your next crushing problem. Representatives from coast-to-coast.

PENNSYLVANIA

BATH-BUILT



CRUSHERS



BELT CONVEYORS SOLVE STICKY COKE HANDLING PROBLEM, CUT DOWNTIME, MAINTENANCE

General Carbon & Chemical Corp. orders second Barber-Greene installation one month after new system starts operation

The General Carbon & Chemical Corp. solved a sticky material handling problem at its Robinson, Ill., calcining plant this winter with dual benefits: far fewer production interruptions; and much lower maintenance of the material moving system. And customer satisfaction led to purchase of a Barber-Greene stockpiling system only a month after this installation began operation.

Barber-Greene conveyor specialists, working with company officials and an engineering firm, replaced bucket elevators with trouble-free belt conveyors. The metal buckets had trouble discharging sticky petroleum coke in cold weather and maintenance had been a two-year problem.

Now petroleum coke moves easily and economically at up to 200 tph from railroad cars to two

rotary kilns at this carbon producing plant. The 520' of Barber-Greene Conveyors in the system consist of: 50' apron conveyor under the track hopper; 55' channel conveyor feeding crusher; 388' channel and truss conveyor to main plant; and a 27' shuttle conveyor to charge dual bins above each kiln.

One man operates the entire conveyor system and also controls shuttling of railroad cars.

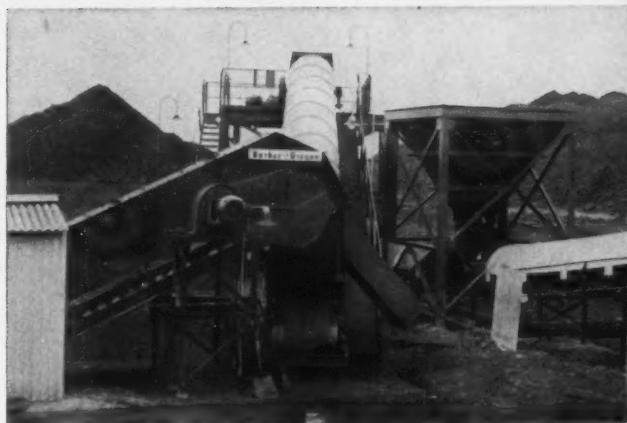
You can achieve an equally sound and profitable solution to your material handling problems by calling in your Barber-Greene Conveyor Representative. He offers most efficient design, lower cost standardized components, fast quotation, delivery and erection on your special or standard conveyor system.



Panoramic view of one-man operated Barber-Greene conveyor system that moves petroleum coke at 200 tph from railroad cars to kilns at General Carbon & Chemical Corp. calcining plant at Robinson, Ill.

Here coke moves from track hopper via apron conveyor to 55' channel conveyor feeding double roll crusher. Crushed coke then is conveyed 388' upgrade to kilns.

Typical of many standardized conveyor components employed on job is new 66" truss which allows long spans between support formerly achieved only with expensive galleries.



SEND FOR NEW IDLER BULLETIN

New 44-page Idler Bulletin describes the more than 800 units available in the complete Barber-Greene line, tells how their years-ahead features bring longer life and greater economy to every job. Ask for your copy today.

Your belt conveyor equipment headquarters

Representatives in Principal Cities of the World

Barber-Greene

Main Office and Plant AURORA, ILLINOIS, U. S. A.
Plants in DeKalb, Illinois..Detroit..Canada..England..Brazil..Australia



CONVEYORS • LOADERS • DITCHERS

ASPHALT PAVING EQUIPMENT

"'Live track' power steering rock...SO WE KEEP OUR TD-25

—Asheville Contracting Company,

Shale and blue granite rock make up 85% of the 550,000-cu. yd. of roadway excavation on this contract—5.18 miles of Blue Ridge Parkway construction, for the United States Department of Interior.

That's why Asheville Contracting Company places maximum reliance on their "rock-movers' special": king-sized International crawler power! Where the going's too tough or job progress is too slow and costly with big clutch-steered crawlers, "Asheville's" new 230-hp TD-25 and two veteran TD-24's take over—and "run interference."

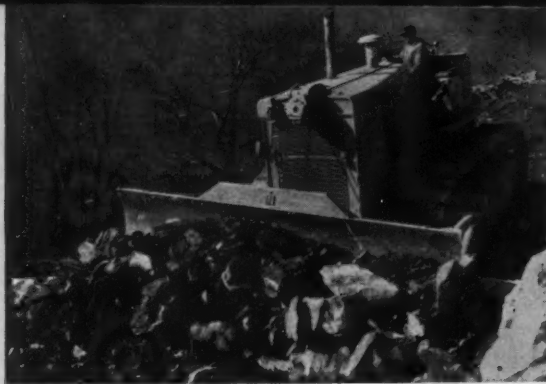
"International 'live track' power steering moves more dirt and rock," states M. H. Reighard, Superintendent of rock operations for "Asheville." "Therefore, we keep our TD-25 and TD-24's on trail-blazing and pioneering. The 'live track' feature keeps the blade in the material and makes steep work safer. TD-25 balance enables working 'almost straight up' on mountainous terrain."

Exclusive, years'-proven International Planet Power-steering gives you full-time live power on both tracks to handle full loads on turns as well as straightaways. Load-limiting "dead-track drag" is eliminated. And



moves more PIONEERING"


Asheville, No. Carolina



"live track" power-steering is combined with on-the-go, Hi-Lo power-shifting that lets you match power to load instantly, for full-speed cycles. You do away with time-wasting "gear-shift lag!"

New TD-25 seven-roller tracks are strength-matched to the full effort of the high-torque, 230-hp turbo-charged Diesel engine! The "25" is platformed on shock-resistant, double-box-beam track frames—smoothly carried on International's dual-protected Dura-Rollers, the track rollers that make 1,000-hr. lube intervals practical!

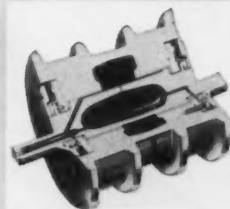
As standard equipment at no extra cost, the TD-25 gives you exclusive, combined Planet Power-steering and Hi-Lo on-the-go power-shifting. And you get this work-speeding design advantage in torque-converter or direct drive model. Here, Asheville's "25" operator is ready to "shift-up" to keep the load on the move.



Power-steer and power-shift the TD-25 with king-sized loads—around curves, upgrade, anywhere! Compare planet-powered "25" ability to deliver full-load capacity, full-time—to outearn other big rigs up to 50%—blading rock, benching, push-loading, mass-production dozing (where fast reverse and decelerator action count), ripping shale! Let your International Construction Equipment Distributor demonstrate!

Even with an enormous offset load of shot-rock there's no "bank-nosing," no sluing. The TD-25 operator simply operates the load-side track in high-speed range—the other track in low-speed range. Result: full-capacity, straight-ahead performance—the same as the "25" gives on benching, bank-cutting, or side-casting!

Heavy-duty TD-25 Dura-Rollers feature thick, deflection-proof shells; full-floating, precision fitted seals; king-sized lube reservoirs; and exclusive pressure-relief passages that protect seals from overlubrication. These minimum-maintenance track rollers give you practical 1,000-hr lubrication intervals!



**International[®]
Construction
Equipment**

International Harvester Co.,
180 North Michigan Ave., Chicago 1, Ill.
A COMPLETE POWER PACKAGE

"Watchdog" of your Conveyor System

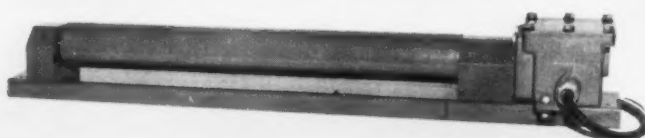
CENTRIFUGAL SWITCHES for Belt Conveyors

Ask for These Bulletins



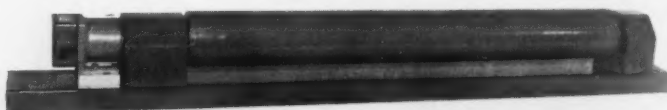
Bulletin 4700

Dust-tight Enclosure



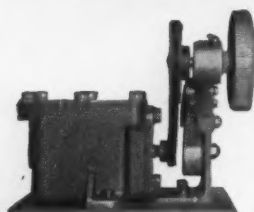
Bulletin 4701

Explosion Tested Enclosure

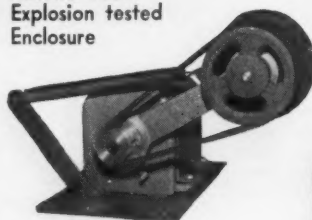


Bulletin 4702C & 4703F

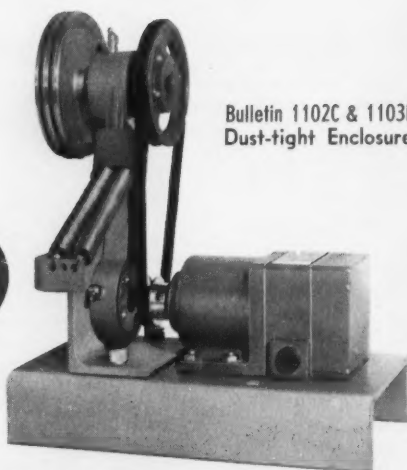
Dust-tight Enclosure



Bulletin 1101
Explosion tested
Enclosure



Bulletin 1100
Dust-tight Enclosure



Bulletin 1102C & 1103F
Dust-tight Enclosure

ENSIGN

ELECTRIC AND

MANUFACTURING CO.

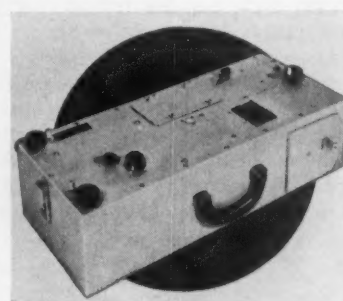
914 Adams Avenue



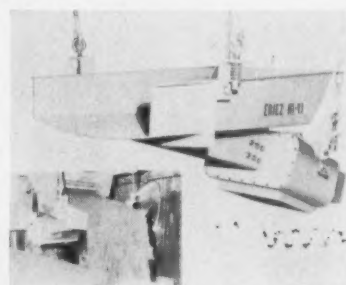
Huntington 4, West Va.

Equipment News (Continued)

use of a palnut, has enough tension to hold the entire assembly in place in the roof until the installer tightens the unit in solidly. An enlarged neck under the bolt head locks the bolt in the center of the plate, eliminating walking. Preassembly with the advantages of a small center hole are the features of the plate. Bolt head pull-through is eliminated and friction reduced with tapered bolt head and flat bearing surface of the plate. Less torque is needed during installation.



MEASURING VIBRATIONS — An accurate easy-to-operate blast and vibration seismograph is produced by W. F. Sprengnether Instrument Co., St. Louis 10. The instrument provides a simple method of determining the true value of vibrations and can be valuable for use in defense against damage claims, notes the firm. Useful in construction to determine the ability of structures to withstand blasting and vibration, the unit requires no technical training to operate. It is self-contained in a rigid aluminum carrying case and weighs only 38 lb. No external power source is required.



BIG CAPACITY FEEDING—Eriez Mfg. Co., Erie, Pa., places coal men among those who might be especially interested in its new Model 75A heavy-duty vibrator. The 75A, with an output of 75 tph, can handle a wide range of materials and a variety of particle sizes. Available as a suspended or base-mounted unit, its capacity is substantially increased when operated downslope, notes the firm. Working on the same push-pull principles as smaller Eriez Hi-Vi feeders, the unit



ROYAL BLUE—we put a lot of work
into it—You get a lot of work out of it.

ROEBLING ROYAL BLUE WIRE ROPE This is rather a long view of a wire rope that's a real work horse. Time and tests have taught us at Roebling that wire rope users *want* the long view. What else, they say, are they spending their money for?

Here, you're looking through a length of Royal Blue whose core has been removed to show the uniformity and symmetry of the rope structure. You see how concerned we are with internal security.

This is one of the reasons why Royal Blue lives up to the day-to-day demands made upon it. High stresses and unavoidable overloads, abrasion, fatigue, impact, crushing, sheave pressures and abusive drum-winding, to name the major ones.

We have to know that the rope we build will do what we sell it to do. Numerous quality-control measures help us—as they do you—to take the long view of Royal Blue. For details about long-lasting Roebling Royal Blue, ask your wire rope distributor or write Roebling's Wire Rope Division, Trenton 2, New Jersey.

ROEBLING 

Branch Offices in Principal Cities • John A. Roebling's Sons Division • The Colorado Fuel and Iron Corporation

Metallurgical Memo from General Electric



Bit illustrated: CC-12

MUSCLE.

In mining, muscle means money . . . and Carboloy® mining bits are mighty muscular. They bite out more coal tonnage per shift, are built to last longer, earn their keep a hundred ways.

Heard *that* story before? Probably more times than you can remember. But don't accept what we say as gospel truth — *prove* it for yourself! Try Carboloy mining bits in your operation. Try them and *compare* them. Watch your output-per-bit soar. See how the strength of the braze and the consistently high quality of Carboloy cemented carbides, plus the optimum physical properties of the shanks, all work together to give you the best return on your investment.

Your authorized Carboloy Mining Tool Distributor can supply you with the right Carboloy mining bit for *every* job. His name is on the next page. Check with him now! And take advantage of G-E's local engineering service. No obligation. *Metallurgical Products Department of General Electric Company, 11145 E. 8 Mile Street, Detroit 32, Michigan.*



CARBOLLOY®
CEMENTED CARBIDES

METALLURGICAL PRODUCTS DEPARTMENT

GENERAL  ELECTRIC

CARBOLLOY® CEMENTED CARBIDES • MAN-MADE DIAMONDS • MAGNETIC MATERIALS • THERMISTORS • THYRITES • VACUUM-MELTED ALLOYS

Complete service through factory and distributor assistance



AUTHORIZED CARBOLOY[®] MINING TOOL DISTRIBUTORS

ALABAMA

Birmingham 2—Shook & Fletcher Supply Company

COLORADO

Denver—The Mine & Smelter Supply Company

ILLINOIS

Mt. Vernon—Pickard Industries, Inc., Central Mine Supply Division

INDIANA

Terre Haute—The Mine Supply Company, Inc.

KENTUCKY

Harlan—Kentucky Mine Supply Co., Inc.
Hazard—Speck Cornett Supply, Inc.
Madisonville—Pickard Industries, Inc., Central Mine Supply Div.
Pikeville—Big Sandy Electric & Supply Co.

OREGON

Portland—J. E. Haseltine & Company

PENNSYLVANIA

Charlottesville—Mining Tool Service, Lee Supply Co.
Washington—Fairmont Supply Company

TEXAS

El Paso—The Mine & Smelter Supply Co.

UTAH

Salt Lake City—The Mine & Smelter Supply Co.

VIRGINIA

Andover—Central Supply Co., of Va., Inc.
McClure—Erwin Supply Company

WEST VIRGINIA

Bluefield—Bluefield Supply Co.
Bluefield—Fairmont Supply Company
Bluefield—Rish Equipment Company
Charleston—Rish Equipment Company
Clarksburg—Rish Equipment Company
Fairmont—Fairmont Supply Company
Montgomery—Marathon Coal Bit Company, Inc.
Shinnston—Erwin Supply Company

Equipment News (Continued)

has an electro-permanent magnetic drive system which operates directly from AC without a rectifier. Drive elements are enclosed and protected from moisture and contamination by foreign materials. Five standard size trays in flat and tubular designs are available but special sizes can also be furnished.



PRE-FAB BUILDING—A new multi-purpose pre-fabricated steel building, the Spartan, made by Martin Steel Co., Mansfield, Ohio, is said to be ideally suited for the mining industry. Its uses run from office and bunk-house to equipment storage and other uses. Fireproof and rust-resistant, the unit has been safety-engineered and precision-constructed for long-lasting service, declares Martin. It is available as a standard wind and roof-load unit as well as a heavier-duty model. The Spartan comes in widths of 12-ft multiples, permitting buildings up to 72 ft wide. Lengths start at 32 ft coming in multiples of 16 ft for any desired lengths. Heights are 10, 12 or 14 ft.

FREEZE-PROOF COAL—A product to prevent freezing of coal is sold by Hardy Salt Co., St. Louis 66, Mo. Called "Freeze-Pruf," the compound contains a phos-

phate additive that sticks to metal surfaces to protect against oxidation and electro-chemical corrosion. The compound comes either dry or as a liquid.

Equipment Shorts

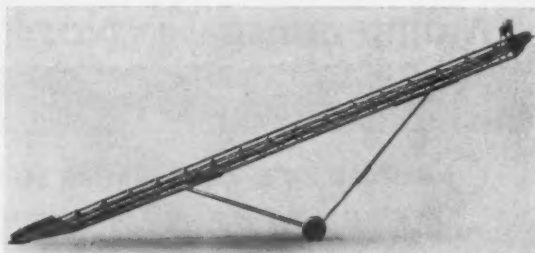
Earthmoving—A heavy-duty rear-attached blade for earth moving with ability to match the performance potential of newer models of tractors is being marketed by Ford Motor Co.'s Tractor & Implements Div., Birmingham, Mich. The blade, with frame members of rugged steel tubing, and reinforced throughout its length by steel plate, takes big bites and can be attached to all tractors with Categories I and II three-point implement linkage systems.

Couplings—"Sure-Flex" spacer couplings equipped with special detachable hubs which permit coupling of shafts as far apart as 7½ in are made by T. B. Wood's Sons Co., Chambersburg, Pa. The couplings are designed to withstand 5 to 15 times more shock and vibration than other flexible couplings, says the firm. Standard units range from a minimum stock, bore ¾ in to a maximum bore of 3¼ in.

Hydraulic Control—An improved 165 hydraulic control unit having no externally mounted valves is available for the Caterpillar D8H tractors from Caterpillar Tractor Co., Peoria, Ill. Other changes include a new high-pressure hydraulic oil filter containing one 5-in element. The filter housing is partly recessed in the operator compartment deck adjacent to the hydraulic tank with only 4 in of the housing showing above the deck line.

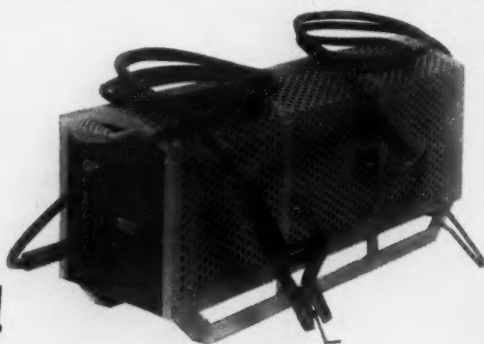
Transit—Charles Bruning Co., Inc., Mount Prospect, Ill., offers transit Model

Portable Conveyors



A new long-reach series of portable belt conveyors available in 18-, 24-, 30- and 36-in belt widths and in lengths of 69, 75, and 81 ft has been announced by Barber-Greene Co., Aurora, Ill. Hourly capacities of the new PA-80 series range from 155 to 630 tph. Structural features include ball bearing troughing carriers and return rollers, permanently-lubricated idlers (optional), V belt drive from electric motor power unit to head-end mounted torque-arm drive, and metal skirt boards for non-spill loading. Despite the size of the portables they may be towed with ease, according to the firm.

BUILT TO TAKE ABUSE!



A truly portable bondwelder built as GUYAN builds everything — **RUGGEDLY** — to stand up under the roughest use.

Ideal for rail bonding, general intermittent welding and similar work. It will develop 80 to 200 amperes in six proportioned taps. These quick-change tapered plug-and-socket taps assure rapid, easy selection of the proper welding current.

Thin design permits easy removal from cars. *And this GUYAN Bondwelder is so easy to handle even in low coal!* Haul it from job to job . . . easily and quickly . . . and put it to work immediately.

Guyan
BOND WELDERS

Don't forget — whether you need a welder for rail bonding, repair jobs in the shops or special welding — there is a GUYAN Bondwelder to meet your requirements.

Write for descriptive literature.
GUYAN MACHINERY CO.
LOGAN, WEST VIRGINIA



Maintenance Tip No. 1

GRIPPER EDGES ON VIBRATING SCREEN SECTIONS

Is the gripper or flange design right for your vibrating equipment? Are the flanges held parallel? Is the radius of the flange hook correct? Does the cloth lie flat? Are the ledges clean? Is the tension drawn on the screen section squarely? Check these points carefully to correct gripper edge problems. Call Cleveland Wire Cloth for valuable assistance and top quality vibrating screen section cloth.

Write for **FREE** maintenance-reducing check sheet today.

THE CLEVELAND WIRE CLOTH & MFG. CO.

3572 EAST 78th STREET

CLEVELAND 5, OHIO

50, a precision instrument featuring securely-sealed permanently-lubricated ball bearing construction for lasting accuracy under all climatic conditions. The firm says high accuracy is obtained on both minimum focus and long-range shots because of Model 50's extremely accurate lens alignment in the 22X power, internal focus erecting image telescope.

Filler Cap—A new filler cap with 30-mesh wire screen for hydraulic fluid and oil reservoirs is a product of the Lenz Co., Dayton 1, Ohio. This is said to be one of the first filler cap assemblies to offer 30-mesh protection. Breather caps are of the vented type of cadmium-plated steel, with twist locking action that fastens securely into the flange.

Switch — Wagner Electric Corp., St. Louis 33, offers a newly-designed externally-operated series multiple switch on dual-voltage single-phase transformers, 5 through 167 kva. The switch permits uprating an entire section of a distribution system at one time. The line is de-energized for only the brief time needed to change the switch setting to the higher primary voltage position.

Tough Grouser Bar — A super-thought "Grip-Lug" grouser bar said to cut installation time up to 43% has been announced by Allied Steel & Tractor Products, Inc., Cleveland 5. The bar features an exclusive shape, permitting the bar to be quickly welded to the worn grouser with just one pass of the welding rod. The design, says the firm, ensures perfect base penetration for the strongest metal bond and permits use of low-cost rod regardless of welding method.

Reducers—A new line of spiral bevel speed reducers which are said to take up less floor space than other reducers has been developed by Hewitt-Robins Inc., Darien, Conn. The reducers have a right-angle shaft arrangement which makes it possible to place the prime mover alongside the driven equipment. The firm notes the spiral bevel gears are more efficient than worm gears used in right-angle drives.

Radiator Guard — A heavy-duty one-piece wrap-around radiator guard designed to protect radiator cores, front-mounted pumps and cable controls is a product of International Harvester Co., Chicago 1. Available for International TD-20 and TD-15 crawler tractors, the heavy-duty outside plate, formed from 5/8-in steel plate, adds strength to the front of the tractor and conforms with the styling.

Free Bulletins

Pumps—Aldrich Pump Co., Allentown, Pa. Complete information on its 25 to

MANITOWOC 4500 VICON^{*}

the only *really new* excavator design since steam!



This big 7-yd. VICON dragline removes 5,500 yards of shale and sandrock overburden every 10-hr. shift. Making 40-ft. deep cuts, the 4500 VICON is equipped with a 100-ft. boom.

The Maniowoc Model 4500 VICON represents the most outstanding advancement of excavator design in decades. Here is a 6 yard shovel or 7 yard dragline incorporating new, tested design principles to give you more yardage in less time than any other mechanical or electrically driven shovel-drag in this size range. Thoroughly proved on the job for over three years, VICON design has increased yardage 25% or better, substantially reduced maintenance costs, and piled up more profits for owners. Some exclusive VICON features are:

INTEGRATED CONTROLS that serve both as clutch operating levers and as engine throttles, providing variable speed control over each function. Clutches, being responsive to lower range of control pressures, are engaged before engines are accelerated. Slippage and overheated friction surfaces are eliminated, lengthening clutch life appreciably.

HOIST AND DRAG DRUMS ARE INTERLOCKED to automatically synchronize their operation. Cycle time is faster and output is greater because full horsepower is always available for hoist—the operator doesn't "soak" it up with the drag brakes. Operating costs are noticeably less because brake use is cut by 50%

and lining wear is drastically reduced. Another advantage of the VICON interlocked drum arrangement is that the operator can "power lower" or free-cast the bucket.

DUAL INDEPENDENT ENGINE POWER with one engine powering the main drums, and the second all other functions. Here are all the advantages of electric or conventional diesel engine mechanical drive without the disadvantages of each. You get the performance characteristics of electric drive — smoother power flow, variable independent speed control, simultaneous operation of dig, hoist, swing, and propel functions—without sacrificing mobility, without incurring the headaches and special maintenance problems of electric drive, without needing a separate power source at every job site. You get the simplicity of mechanical drive without losing valuable production time because of engine "lug down", without needing to jam clutches into engagement at high and harmful engine speeds, without the limitations of operating speeds that are inherent in conventional diesel engine drive.

Why not get the complete story on the *sensational* Model 4500 VICON today? Your nearby Maniowoc distributor has all the facts.

9-A1

* Variable Independent Control

Maniowoc

MANITOWOC ENGINEERING CORP.

(A subsidiary of The Maniowoc Company, Inc.)
Maniowoc, Wisconsin

SHOVELS
1¼ — 6 YDS.

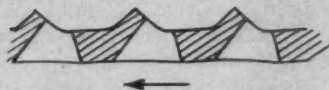
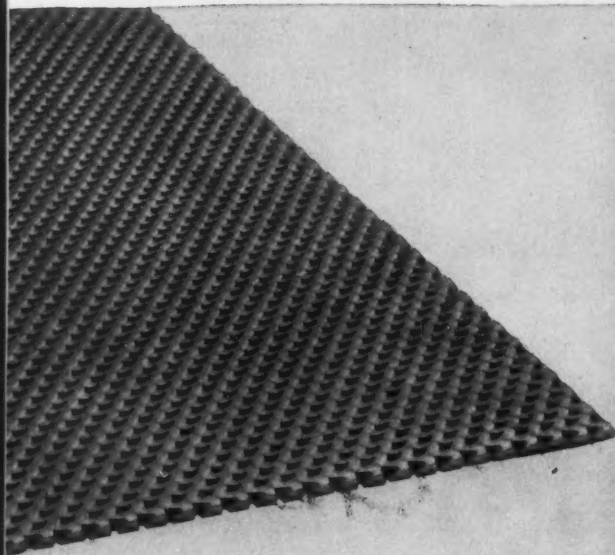
CRANES
25 — 125 TONS

DRAGLINES
1¼ — 7 YDS.

TRENCH HOES
1¼ — 3 YDS.

from NATIONAL-STANDARD

NEW CONCEPT IN SCREENING

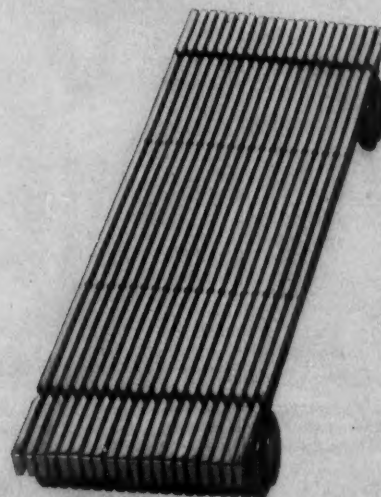


CONIDURE* sheets are available in a complete range of hole sizes and rolled surfaces. The working side of Conidure sheets has shovel-like humps that guide material into the narrow openings, increasing screening action. The extreme taper of the hole prevents clogging or blinding.

New CONIDURE Screens

New Conidure sheets are produced by a unique process of piercing trapezoidal-shaped holes, highly tapered in the screening direction. Sheet thickness can be several times greater than hole diameter for higher capacity and longer wearing life in coal, sugar and chemical centrifuges or on vibrators, separators and screening machines.

*©by Hein, Lehmann & Co., Dusseldorf, Germany



RIMA* screens can be supplied as rectangular, oblique angled, round or oval beds. The complete range of slit widths and wire profiles accommodates a wide variety of screening and filtering operations.

New RIMA Screens

New Rima shaped-wire screens for coal, paper and food processing and water or sewage filtration have special capacity advantages over standard wedge-wire screens because of high-narrow profile wires that provide larger open area. The unique cross bar and spacing lugs keep wires uniformly separated for greater efficiency in screening.

FOR COMPLETE INFORMATION on New Conidure and Rima Screens, write for new illustrated catalog to
NATIONAL-STANDARD COMPANY, NILES, MICHIGAN



NAME _____

COMPANY _____

ADDRESS _____



Cross Perforated Metals

NATIONAL-STANDARD COMPANY
Carbondale, Pa.

Equipment News (Continued)

2,400-hp direct flow pumps is contained in Data Sheet 100.

Switchgear—I-T-E Circuit Breaker Co., Philadelphia 30, offers a new bulletin describing in detail its completely redesigned line of 4,160-V metal-clad switchgear.

Metal Flooring—Joseph T. Ryerson & Sons, Inc., Chicago 80, offers a 12-p booklet on steel and aluminum flooring and stair treads.

Gas Mask—Wilson Products Div., Ray-O-Vac Co., Reading, Pa., has published a leaflet on industrial gas mask canisters and applications.

Abrasion—Coast Metals, Inc., Little Ferry, N. Y., offers a booklet on alloys for abrasion, impact, corrosion and heat resisting services.

Crushing—Pennsylvania Crusher Div., Bath Iron Works Corp., West Chester, Pa., has available a new edition of their "Handbook of Crushing."

Earthmoving—Caterpillar Tractor Co., Peoria, Ill. Described as the machine that "never stops moving," the new Caterpillar 977A Traxcavator is the subject of a new 2-color 8-p booklet.

Processing—Dorr-Oliver, Inc., Stamford, Conn. A new revision of the 16-p brochure "Continuous Processing," Bulletin No. 7004, tells about features and applications of 55 types of continuous processing equipment for various uses.

Shovel-Crane—The Thew Shovel Co., Lorain, Ohio. A 12-p book on Model 50, 25-ton 1-yd crawler-mounted shovel crane includes construction details and photos.

Hoists—Vulcan Iron Works Co., Englewood, Colo. Brochure illustrates and describes variety of mine and utility hoists.

Lift Jacks—Duff-Norton Co., Pittsburgh 22. Complete line of lifting jacks for industry described in 4-p brochure.

Sampler—Hardinge Co., Inc., York, Pa. Revised 8-p catalog on re-designed automatic sampler, is available. Describes arrangement for wet and dry processes.

Compressor—Allis-Chalmers Mfg. Co., Milwaukee 1. Company has what it calls the most complete catalog ever offered covering data on its scroll casing design single-stage centrifugal compressors for air applications.

Clutch Plates—S. K. Wellman Co., Bedford, Ohio. Illustrated bulletin describes Velvetouch Feramic clutch plates.

Our Specialization . . . economically protects your investment!

FLOOD CITY MINE PUMP

RENEWAL PARTS AND REPAIRS



● For many years, Flood City has specialized in furnishing standard replacement parts from stock, and in manufacturing replacement parts for all types of centrifugal and plunger type mine pumps. Damage due to wear and acid can be repaired, and many of the features found on Flood City pumps can be incorporated into the pump when it is rebuilt in Flood City shops. Impellers and other parts can be furnished for any make or type, in any desired material.

FLOOD CITY ENGINEERING SERVICE

We will be pleased to have an engineer consult with you on any parts or pump rebuilding job on which you may desire a quotation . . . at no obligation to you.

For complete economical pump repair and replacement service . . . contact FLOOD CITY!



FLOOD CITY BRASS & ELECTRIC CO.
JOHNSTOWN, PA.

Only 5 minutes to make a RAIL WELD!



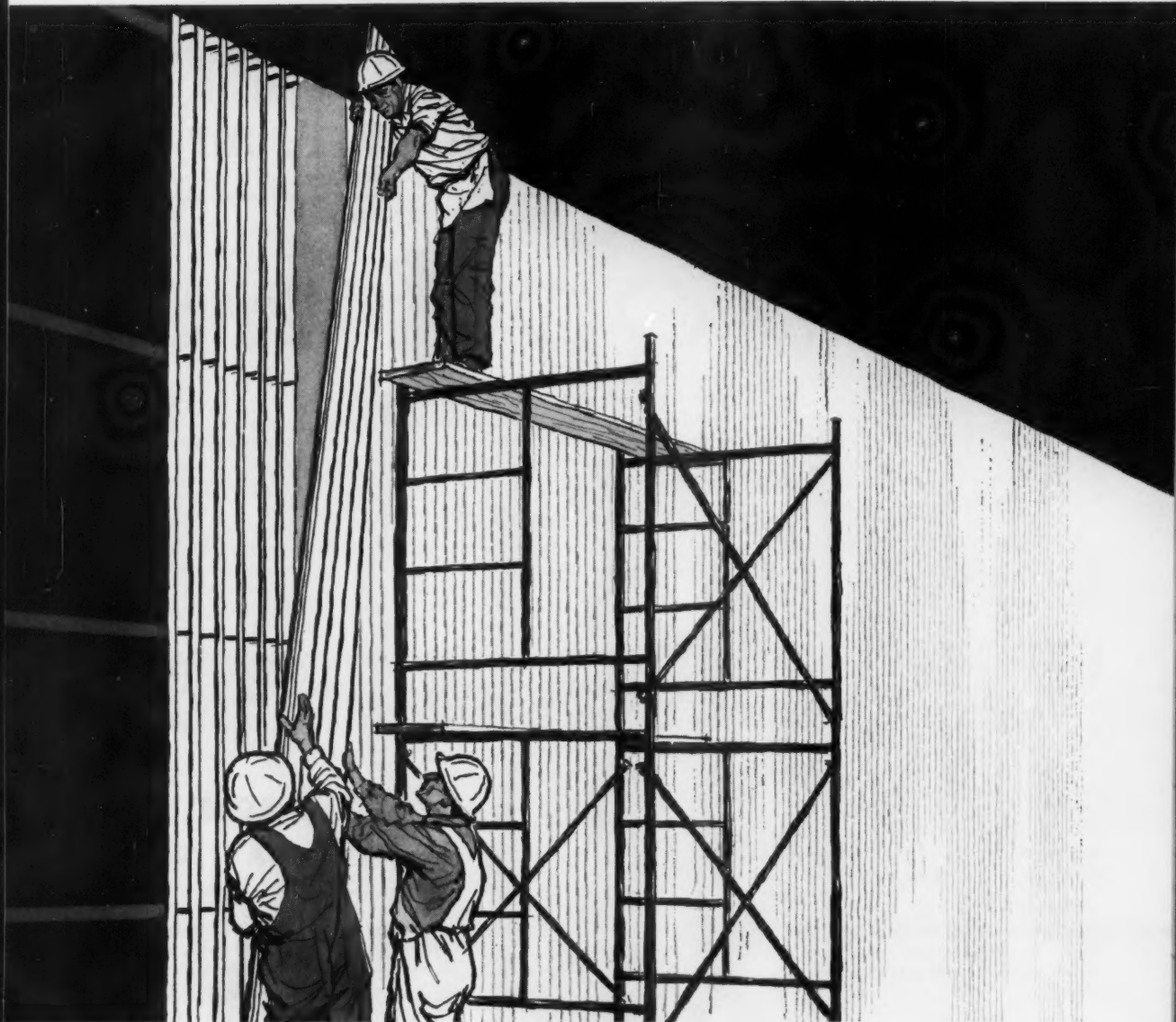
Write for details on the new Thermit Self-Preheat Weld.

Because only three simple steps are required: 1. aligning the rails, 2. applying the molds and 3. pouring in and igniting the welding compound, modern Thermit Welding is the easiest and speediest of all rail welding methods. Time-consuming preheating of rail ends is no longer necessary. The use of factory-made molds eliminates ramming of molds on the job. From start to finish you can actually complete a good, sound weld, having 100% electrical conductivity, in just five minutes.

Cost compares favorably with installing mechanical rail joints. Old rail as well as new can be welded. And, rail can be welded in track.

THERMIT RAIL WELDING

Thermex Metallurgical, Inc., Lakehurst, New Jersey



TRUSCON INSULATED CURTAIN WALL PANELS PROVIDE LOW-COST SURFACE HOUSING...FAST

Truscon Insulated Curtain Wall Panels are the answer to fast, economical surface housing. Ideal for control centers, transfer houses, cleaning storage bins, tipples, blending bins, conveyor covering, and other mining operations.

Truscon Panels are constructed by sandwiching a layer of insulating material between two sheets of Truscon 24" Ferrobord® or galvanized ribbed sheeting. Panels are securely interlocked and button-punched for maximum weather-tightness.

Panels are furnished painted or galvanized, in widths of 2'-0", and up to 40'-0" in length.

Wider, longer lengths of Truscon Panels speed erection time, get equipment under cover fast. Heavy duty insulation reduces noise to a minimum. Protects equipment from severe weather.

Low installation cost, very little maintenance cost, and available for immediate delivery. Call your Truscon representative for complete facts, data, specifications. Or, write direct.



REPUBLIC ELECTRUNITE GROOVED-END TUBING offers cost-saving, time-saving advantages for many mining applications. Quickly and easily joined with Victaulic Couplings. Rugged, Grooved-End Tubing is ideal for air, water, drainage lines and other heavy duty operations. Can be taken up and relaid as mine run changes. Write for additional information.

REPUBLIC MINE ROOF BOLTS OFFER FIVE CERTIFIED-PERFORMANCE FEATURES.

1. *Precision-Tapered Plug* expertly engineered for proper shell expansion. Angle of the taper is at the precise degree required for strength, dependability, and quick efficient tightening. 2. *Heavy-Duty Support Nut* gives over 40% better support than even the best previous method, yet maintains correct bolt tension by stripping at approximately 50 pounds torque with no damage to threads. 3. *High Strength, All Purpose Expansion Shell* is designed for effective use in any type of strata. Wide, strong leaves mean extra holding power. 4. *Improved Self-Centering Head*, compact, one-piece head eliminates the need for separate washer. 5. *Material Control Certificate* included with every shipment of Republic Roof Bolts, stating physical properties of the steel used. And, Republic Roof Bolts are pre-assembled to cut your installation costs. Send for additional data.



REPUBLIC ELECTRUNITE "DEKORON-COATED" E.M.T. COMBATS CORROSION in atmospheres that destroy ordinary conduit. Resists fumes, dust, gases, and chemical action of corrosive service. Every length fully protected from end-to-end by armor-tough, corrosion-proof polyethylene applied over the galvanized surface. The "Dekoron-Coated" E.M.T. in this coke conveyor gallery has been in service 18 months and is still practically new. Write for additional information.



REPUBLIC STEEL

*World's Widest Range
of Standard Steels and Steel Products*

REPUBLIC STEEL CORPORATION

DEPT. CA-1145

1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send more information on the following products:

- ☐ Truscon Insulated Curtain Wall Panels
- ☐ Mine Roof Bolts
- ☐ Republic ELECTRUNITE® Grooved-End Tubing
- ☐ Republic ELECTRUNITE "Dekoron®-Coated" E.M.T.

Name _____ Title _____

Firm _____

Address _____

City _____ Zone _____ State _____

NEW! REVERSIBLE RATCHET BIT WRENCH

... Speeds bit changing
time on all mining
machines using
3/4" set screws

Look At This...Saves 1/2-Hour Every Shift

Keep one on each machine...
you'll make extra savings on
every bit changing job

PAT. PENDING

Solid, forged steel
handle is 18 1/2" long.

Only reversible ratchet bit wrench made... changes
direction of stroke without removal. Works efficiently
even where side clearance is only 1/2". Box-wrench
on one end is for "Sledge-hammer jobs." A required
tool on machines where more profitable operation is
important.

Write for Illustrated Literature and Prices — FREE
NORTH AMERICAN GEAR COMPANY
39 East Campbell Street Blairsville, Pa.

Mfr's of
Parts For
Mining
Machinery



Among the Manufacturers

Dr. Robert E. Fariss has been named director of research for the Hulburt Oil & Grease Co., Philadelphia. Dr. Fariss, formerly a director of research for the Baroid Div., National Lead Co., has accepted the top post in research at Hulburt, and will direct their newly expanded research

department. He will give special attention to the new and elaborate program devoted to fire-resistant hydraulic fluids. He will spearhead the future research on emulsions and coordinate the new department devoted to technical hydraulic emulsion sales service. It is felt that the emulsion fluids will require extensive specialized and competent field service and such service must be closely coordinated between Hulburt research laboratories and field engineers. Dr. Fariss is one of the world's foremost authorities in the field of inorganic grease thickeners.



R. E. Fariss

He also has a broad background in new fields of emulsion technology. Prior to directing research at National Lead, he was employed by Dow Chemical Co. and the Texas Co. He received his doctorate at Rice Institute in 1950, majoring in the field of physical chemistry. He is a member of the American Chemical Society and the American Institute of Chemical Engineers. He has been very active in the National Lubricating Grease Institute and has presented two fundamental papers on inorganic thickeners to this organization.



W. L. Dowdey



D. Dahlstrom

Three promotions have been announced by The Eimco Corp. Wayne L.

Dowdey, general sales manager, has been elected a vice president along with Dr. Don Dahlstrom, director of Eimco's research and development department. T. F. Olson, formerly comptroller for Crane Co., has been named financial vice president. Mr. Dowdey joined Eimco in 1945 as a sales engineer, advanced through the post of manager of the southern and Pittsburgh districts to general sales manager. He is a member of the AIME and a resident of Birmingham, Ala. Dr. Dahlstrom has been with Eimco since 1952 prior to which he was associate professor in chemical engineering at Northwestern University. He is a member of several chemical societies and lives in Deerfield, Ill. Mr. Olson is a graduate of the University of Illinois and is an active member of the National Association of Accountants.

Lawrence Gillen has been named manager of sales and Henry Ellas will be manager of sales-mill products, for Electric Steel Foundry Co., Portland, Oregon. Mr. Gillen has been field engineer for the Portland sales district composed of Portland and northwestern Oregon, southern



L. Gillen

Washington and southern Idaho. He will supervise the sale of all ESCO products, including earthmoving equipment, construction equipment, pipe fittings and a wide range of stainless and high-alloy castings. As manager of sales-mill products, Mr. Ellas will supervise the entire sales program of the stainless steel and plastic materials and products which ESCO distributes.

Schroeder Bros. Corp., McKees Rocks, Pa., has been appointed sales and service representative for the "Ratio-Feeder" made by the Mining Equipment Div. of Columbus McKinnon Chain Corp.

(Continued on p 170)

CONTRACT CORE DRILLING

EXPLORATION FOR MINERAL DEPOSITS
INCLUDING URANIUM & LIMESTONE — ANYWHERE

FOUNDATION TEST BORING • GROUT HOLE DRILLING

Skilled crews and complete stock of core drills
and accessory equipment maintained at all times

Core Drill Contractors for more than 60 years

JOY MANUFACTURING CO.
Contract Core Drill Division
MICHIGAN CITY, INDIANA



Where heavyweights move job records prove... **FIRESTONE STAMINA KEEPS PROJECTS ON SCHEDULE!**

That sure-fire stamina of cord and rubber in Firestone off-the-highway tires pays off big. These dependable tires keep costly equipment on the go and meet tightest schedules. Such exclusives as Firestone Rubber-X—longest-wearing rubber ever built into Firestone tires—and Firestone Shock-Fortified nylon cord—that takes the most gruelling impact punishment in stride—see to that! Another plus: Firestone's Giant Tire Service stands back of every Firestone tire, and a Firestone Tire Expert will match tires to specific project needs and handle your tire maintenance problems. For more worktime and less downtime, see your Firestone Dealer or Store. Or write: Manager, Off-The-Highway Tires, The Firestone Tire & Rubber Co., Akron, Ohio.

ALWAYS SPECIFY FIRESTONE TIRES WHEN ORDERING NEW EQUIPMENT

Firestone

BETTER RUBBER FROM START TO FINISH



Super Rock Grip
Wide Base*

Super Rock Grip
Deep Tread*

TUBELESS OR TUBED

Copyright 1960, The Firestone Tire & Rubber Co.
*Firestone T.M.



IN DENVER SINCE 1891
2960 SOUTH FOX STREET
ENGLEWOOD, COLORADO



VULCAN SLOPE ROLLERS
• Rubber or Neoprene
• REPLACEABLE Segments
• Sealed Ball Bearings
Cat. No. 117



VULCAN MINE SHEAVES
• Cast Steel Meehanite
• Flame Hardened Grooves
or Replaceable Liners
Cat. No. 117



VULCAN MINE HOISTS
• Small, Medium or Large
• Single, Double
or Divided Drum
Cat. No. AC 6002

VULCAN AUTOMATIC OR PUSH BUTTON OPERATED HOISTS

Now economical for production in small
mines or man service large in mines.

Catalog No. AC 6002



VULCAN SKIPS & CAGES
• Bottom Dump
or Vertical Skips
• Aluminum or Steel Const.
• Rubber Guide Wheels
Cat. No. DA 6009



VULCAN SLUSHER HOISTS
• 10-150 HP—Standard
or Special Design
• Single, Double or
Triple Drum
Cat. No. DB 5709



VULCAN CHAIN SAWS
Air or electric powered.
Cat. No. JB 5805



ALIMAK RAISE CLIMBER
**SAFER
CHEAPER
EASIER**
Built-in air and
waterlines remote control
valve stations.
Write For Literature

MEEHANITE® CASTINGS CUSTOM FABRICATIONS

Special Designs of All Equipment

Represented Internationally through
DORR-OLIVER, INC., Stamford, Conn.,
and associated firms

Manufacturers (Continued)

James V. Carlin Jr., has been named vice president of sales, for Acme-Hamilton Mfg. Corp., Trenton, N. J. Mr. Carlin was formerly general sales manager for the Acme Rubber Mfg. Co., division of Acme - Hamilton. He has been with the company for 14 yr, starting as a sales representa-



J. V. Carlin Jr.

tive in Philadelphia. He is a graduate of the Wharton School of Finance of the University of Pennsylvania and lives in Yardley, Pa., with his wife and two sons.

Gene P. Robers has been appointed general sales manager, Thermoid Div., H. K. Porter Co., Inc., and will be at the division's headquarters in Pittsburgh. Mr. Robers comes to Thermoid, producer of industrial rubber products, with 20 yr of experience in the automotive and industrial equip-



G. P. Robers

ment field. He has been vice president of the Carter Carburetor Div., ACF Industries. A member of various trade associations, he currently is vice president and a director of the Automotive Service Industries Association.

Ralph W. Ramer has been appointed manager of the central district for the W. S. Tyler Co., replacing James W. Sullivan, who has been transferred to the firm's headquarters in Cleveland. Mr. Ramer will be located at the company's new offices for the Woven Screen and Screen-



R. W. Ramer

ing Machinery Divs., in Chicago. He will direct sales of these Tyler products in Illinois, Missouri, Kansas, Oklahoma, Arkansas and southeastern Wisconsin. He comes to the company from the Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., Palmer, Mass., where he has been sales and product manager for industrial wire cloth and allied products.

Company Briefs

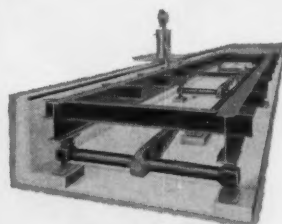
American Air Filter Co., Inc., announced three changes. Named to new

Winslow TRUCK SCALES PIT AND PITLESS TYPES



TYPE CS—PORTABLE—PITLESS

Capacities 15 tons thru 50 tons. Platform sizes 18' x 9' thru 50' x 10', wood or steel deck.



TYPE S—PIT SCALE

Capacities 15 tons thru 60 tons. Platform sizes 22' x 9' thru 60' x 10' for wood or concrete decks.

PHONE NORTH 1231

**WINSLOW GOVERNMENT STANDARD
SCALE WORKS, INC.**
2505 HAYTHORNE TERRE HAUTE, IND.



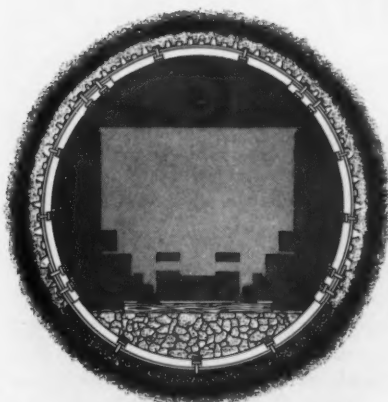
Next time get
LESCHEN
Wire Rope

LESCHEN WIRE **PORTER** ROPE DIVISION
H. K. PORTER COMPANY, INC.

**WHEN
PRESSURES
SQUEEZE
FROM ALL
DIRECTIONS**



...install Bethlehem Yieldable Rings



Lagging should completely surround the Yieldable Ring set. Poles, planks, steel ties make good lagging.



For strength
... economy
... versatility

If your mine opening has a heaving bottom, or is subject to squeezing pressures from all directions, the Bethlehem Yieldable Ring offers the best means of control. The Ring is a four-piece yieldable set with four joints instead of the usual two found on the Yieldable Arch.

Essentially, the Yieldable Ring is similar to the Yieldable Arch. It is made of the same nestable U-shaped sections, works on the same sliding-joint principle, and is available for the same range of mine openings—from 6 to 20 ft in diameter.

Installation of the Ring set differs from the Arch in that the two joints at the bottom of the ring should be tightened to about 150-ft-lb, instead of the 180-ft-lb torque normally applied. This is due to the fact that the bottom two joints usually will lie in muck, which adds measurably to the friction in the joint.

One more important point: with the Yieldable Ring, as with the Yieldable Arch, lagging and packing are necessary to fill the voids between steel and rock. Lagging should *completely surround* the Yieldable Ring, as shown in the sketch.

Bethlehem engineers will be glad to visit your workings to determine how the Yieldable Ring or Arch might improve your roof control. For action, just get in touch with the nearest Bethlehem office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL



Manufacturers (Continued)

positions were: Charles S. Stock, manager, central marketing; Frank K. Platt, manager, school air systems; and A. B. Ullrich Jr., manager, engineered air systems.

Westinghouse Electric Corp., named three to new spots: James M. Wallace, manager, Manufacturing & Repair Div.; Ray H. Timmons, manager, central regions, for the M&R Div.; and William

T. Fitzer, assistant to the division manager.

Richard D. Hedreen is named director of sales, Du Pont Co., Explosives Dept., succeeding Joseph A. Dalls, named director of manufacture for the department.

Paul R. Williams was named assistant service manager, Mining Div., The Jeffrey Mfg. Co.

Carroll R. Justice was named vice president, sales, Steel Products Div.,

United States Steel Corp., Pittsburgh.

Morris Machine Works named Bernard Lockwood as sales engineer and William Beall as test engineer.

William R. Tise has been named chief engineer, conveyor product sales, United States Rubber Co.

W. R. Neil Currie has been appointed sales engineer, St. Louis office, for Nordberg Mfg. Co.

Mansbach Steel Co., Ashland, Ky., reports it will stock a greater variety of stainless-clad plates from Lukens Steel Co.

Remington Rand Div., Sperry Rand Corp., and Nationwide Leasing Co. announced a new long-term lease plan involving all types of office machines and systems products.

Daniel E. McDade has been named manager of the new Charleston, W. Va., office of I-T-E Circuit Breaker Co.

V. L. Snow has been chosen as general manager of Euclid Div., General Motors Corp., succeeding R. Q. Armington.

Merrick Scale Mfg. Co. has appointed as sales representatives R. P. Hoppe Co., Pittsburgh, and Charles Gipperich, Louisville, Ky.

Fairmont Machinery Co. and its subsidiary, Lecco Machinery & Engineering Co., have expanded their sales organization to include the Rocky Mountain areas and California.

Richard C. Mitchell, Man, W. Va., is a sales representative for the Salem Tool Co.

Bucyrus-Erie Co. announced that all drill sales operations are being moved from Richmond, Ind., to the firm's main offices at South Milwaukee, Wis.

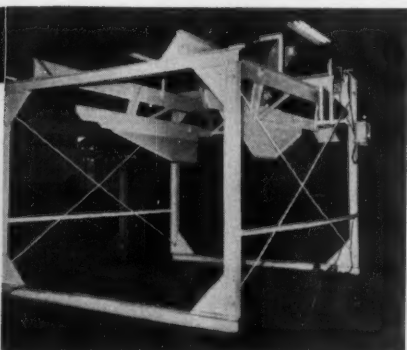
John W. Carlson has been named assistant general manager, Construction Machinery Div., Allis-Chalmers Mfg. Co.

Pennsylvania Crusher Div., Bath Iron Works Corp., has named Joseph P. Hensel manager, machinery sales, and George O. Thompson district sales representative, St. Louis territory.

Industrial Supplies, Inc., Memphis 1, Tenn., has been appointed a warehouse distributor for the Boston Woven Hose & Rubber Div., American Biltrite Rubber Co., Inc.

Donald J. Wallace has been named district sales manager for the Coffing Hoist Div., Duff-Norton Co., with headquarters in Chicago.

For
BIG SAVINGS
in
Time and Labor
Maintenance Expense
Installation Cost
Check These
Features of the
STAMLER
Automatic TILT PAN



- It automatically loads entire trip without belt stoppage or spillage between cars.
- It permits use of boom man on productive face jobs.
- It provides uniform car loading without an attendant.
- It can be quickly installed and easily moved.
- It operates with existing car spot- ters without special hydraulic power units.

- It operates with non-uniform car lengths.
- It is self-adjusting for dented car bodies.
- It automatically shuts down without spillage if the last empty car becomes loaded.
- It fits into the same head room as manually operated flygate chute.
- Fail safe under any emergency.

Get all the facts on the **STAMLER** Automatic Tilt Pan. Write today for folder.



W. R. STAMLER
PARIS, KENTUCKY

SCHROEDER BROTHERS, Exclusive Eastern Sales Agent
Pittsburgh, Pennsylvania

UNION INDUSTRIAL CORP., Carlsbad, New Mexico

SALMON & CO., Birmingham, Alabama

WESTERN SALES ENGINEERING CO., Salt Lake City, Utah

COAL CLEANING made easier with **MAGNAFLOAT®**

MAGNAFLOAT...Foote's specially processed magnetite—has what it takes for fast and efficient heavy-media separation of clean coal from refuse in raw run-of-mine:

- low cost
- high magnetic susceptibility
- low consumption per ton of cleaned coal
- minimum abrasion and corrosion of equipment
- wide range of media densities
- shipped promptly

This popular ferrous medium is available in three grades: A Grade (max. 5% on 100 mesh, 55-70% thru 325 mesh); B Grade (90% min. thru 325 mesh); C Grade (all thru 65 mesh, approx. 50% thru 325 mesh). Write for details.



FOOTE MINERAL COMPANY
470 Eighteen West Cheltenham Building
Philadelphia 44, Pa.

CF&I-WICKWIRE **DOUBLE GRAY-X®**



*gives
longer
service life*

Wickwire's new wire drawing process builds a permanent molecular shield around each wire in Double Gray-X, reducing the friction between the wires. Result: a wire rope with greater resistance to bending, crushing and abrasion. Double Gray-X gives 15% greater breaking strength than catalog breaking strength of improved plow steel rope with IWRC.

Double Gray-X is available in a wide range of sizes and constructions for all types of mining equipment. CF&I-Wickwire also makes a complete line of slings and fittings. For full details, call the nearest CF&I office listed in your phone directory.

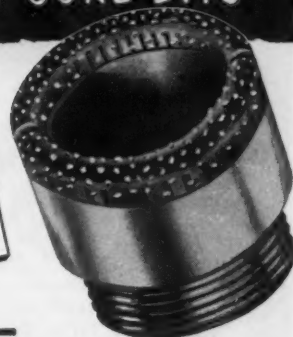
OFFICES LOCATED IN KEY CITIES EVERYWHERE

WICKWIRE ROPE
THE COLORADO FUEL AND IRON CORPORATION

Wickwire Spencer Steel Division: New York, N. Y.
Pacific Coast Division: Oakland, California
The Colorado Fuel and Iron Corporation: Denver, Colorado



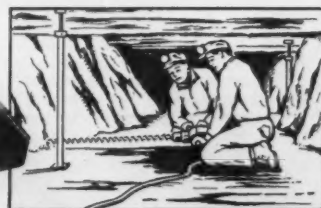
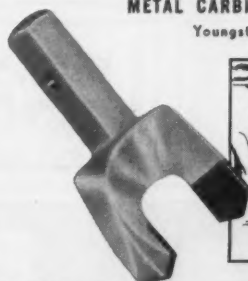
SUPERSET CORE BITS



• Mining contractors, ore prospectors, coal operators and construction firms are realizing tremendous savings by taking advantage of our exclusive fabrication service! Contractors send us the necessary diamond stones from their own stocks—we hand set them in a super-hard tungsten carbide crown and braze to the threaded steel blank. Hand-set bits assure the proper positioning of each diamond stone to achieve maximum cutting efficiency. The carbide matrix holds the diamond stones until entirely used up. These advantages mean lower drilling costs to you. We can also supply complete core bits or salvage the stones from used bits at nominal cost. Supplied in standard sizes EX, EXE, AX, BX, NX, etc.

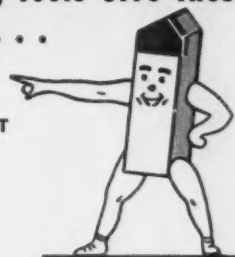
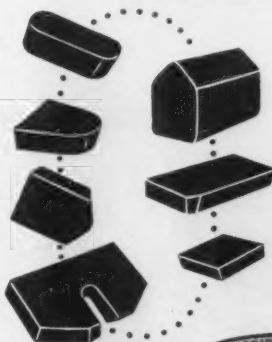
METAL CARBIDES CORPORATION

Youngstown 12, Ohio



**Talide Tips for Mining Tools Give These
3 BIG ADVANTAGES . . .**

1. EXTRA STRONG
2. SUPER HARD
3. SHOCK RESISTANT



• A complete line of low-cost, high-quality Talide Tips is offered fabricators and users for tipping machine bits, rock bits, drill bits, roof bits and open-pit bits. All Talide Tips have a special surface finish that facilitates brazing. Non-standard shapes and sizes quoted on request.



PROFESSIONAL SERVICES

ALLEN & GARCIA COMPANY

More than 50 Years' Service to the
Coal and Salt Industries
Consultants, Construction Engineers and Managers
Authoritative Reports and Appraisals
332 S. Michigan Ave., Chicago
120 Wall Street, New York City
816 Chappell Rd., Charleston 6, W. Va.

EAVENSON, AUCHMUTY & GREENWALD

Mining Engineers

COAL OPERATION CONSULTANTS
VALUATIONS

2720 Koppers Bldg.

Pittsburgh 19, Pa.

MOTT CORE DRILLING CO.

Contractors

Exploration of Coal Properties. Guarantee satisfac-
tory coal cores. Inside Mine Drilling. Pregrouting.
Mine Shafts, Large diameter holes.

Huntington 17, W. Va.

AMERICAN AIR SURVEYS, INC.

TOPOGRAPHIC MAPS FOR MINING
AERIAL PHOTOGRAPHS

907 Penn Ave., Pittsburgh 22, Pa.
Offices—Manhasset, N.Y.—Atlanta, Ga.

THERON G. GEROW

Mining Consultant and Engineer

1705 Morgan Ave. So. Minneapolis 5, Minnesota

DAVIS READ

Consulting Engineer

Layout — Operation
Modern Production Methods
Plant Design — Preparation

1020 Adams Street

Sturgis, Ky.

ATLAS RAILROAD CONSTRUCTION CO.

Railroad Track Specialists

Engineering Construction

Maintenance
Express Highway West
Bentleyville, Pennsylvania

HOFFMAN BROS. DRILLING CO.

Drill Contractors Since 1902

Specialists in exploratory—grout hole and pressure
groutings. Rigs located in over 50 strategic areas for
prompt service. Free estimates.

104 Cedar St.

Punxsutawney, Penna.

ROBINSON & ROBINSON

Consulting Engineers

Mine Operation—Preparation
Coal Property Valuation
Industrial Engineering

Union Bldg.

Charleston, W. Va.

GEO. S. BATON & COMPANY

"Founded 1900"

Consulting Engineers

Cost Analysis — Valuations
Mine and Preparation Plant Designs
1100 Union Trust Building Pittsburgh 19, Pa.

KIRK & COWIN, INC.

Ralph E. Kirk Percy G. Cowin

*Registered Professional Engineers
Consulting—Reports—Appraisals*

Mechanical Mining of Ore & Coal
Management and Construction of Mines
1—18th St., SW—Birmingham, Ala.
Phone St 6-5566

PAUL WEIR COMPANY

Established 1936

Mining Engineers & Geologists

DESIGN AND CONSTRUCTION
INDUSTRIAL ENGINEERING

20 North Wacker Drive

Chicago 6, Illinois

C. Ed BERRY

Coal Preparation Engineer

SPECIALIZING

OIL TREATING—FREEZE PROTECTION
BULK DENSITY & HANDLING

702 Benoni Ave., Fairmont, W. Va. - Ph. 4592

HERBERT S. LITTLEWOOD

Consulting Electrical Engineer

Evergreen Hills

Irwin, R.D. #3, Penna.

J. W. WOOMER & ASSOCIATES

Consulting Mining Engineers

Modern Mine Systems and Designs
Foreign and Domestic Mining Reports

Oliver Building—Mellon Square, Pittsburgh, Penna.



How ARE YOUR COMMUNICATIONS?

Have you tested your company publications lately? Do they really *work* for you? Today your entire operation is judged by each piece of literature you produce. If you have any doubt as to the impact of your vital communications, remember . . .

COMMUNICATION IS OUR BUSINESS

TWS will write, design, and print your Instruction Manuals, Product Bulletins, Training Aids, Industrial Relations Literature, Annual Reports, Company Histories, etc. Save money and time. Let our staff be your staff for Technical and Business publications.

TECHNICAL WRITING SERVICE
McGraw-Hill Book Co.
330 West 42nd Street, New York 36, N. Y.
Phone: LOngacre 4-3000

This service is available through ad agencies.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT:
BUSINESS:

OPPORTUNITIES

EQUIPMENT
USED OR RESALE

POSITION WANTED

Well experienced stripping engineer seeks new connection. Correspondence invited with either operator or consultant. PW-5069, Coal Age, Class Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

COAL MINE FOR LEASE OR SALE

Upper Freeport Seam, metallurgical coal low in sulfur, high in fusion, strongly coking. Modern tipple houses 200 ton per hour Baum Jig which cleans run of mine coal, centrifugal dryer, heat dryer, cyclones, etc. Clean coal is sized into 4 primary sizes for loading on 3 trucks. Siding presently accommodates 60 empties, 44 loads. Present Reserves 3659 Acres, additional reserves available from present site: 2000-5000 acres. Favorable freight rate for eastern or northern shipments. Available with or without existing underground equipment which includes belt conveyors, piggy back conveyors, shuttle cars and loaders.

Address all inquiries to BO 4810, Coal Age, Class Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

P 2,000,000 ft. 2" - 3.50¢ to the foot **P**
I 1,000,000 ft. 3" - 2.70¢ **I**
I 1,000,000 ft. 4" - 10.00¢ **I**
P 500,000 ft. 6" - 19.00¢ **P**
E 200,000 ft. 8" - 28¢ **E**
E 400,000 ft. 10" - 35¢ **E**
P 75,000 ft. 12" - 40¢ **P**
E 10,000 ft. 16" - 42¢ **E**
All No. 1 Grade Plain End And Cleaned
INDIANA-OHIO PIPE CO.
P.O. BOX 5412 Shepherd Station
Phone CL 3-5527 Columbus 19, Ohio

FOR SALE

Newest model 30" Joy Extensible Belt with 40 HP Permissible 440 Volt AC motor. Used 4 months. 250 Volt DC Permissible motors and controls for 11BU loader.

Mid-Continent Coal & Coke Co.
Carbondale, Colorado—Woodland 3-2250

**MOTORS • GENERATORS
TRANSFORMERS**
NEW • REBUILT
ELECTRIC EQUIPMENT CO.
WORLD'S LARGEST INVENTORY
CALL COLLECT GL 3-6783
P.O. BOX 51 • ROCHESTER 1, N. Y.

FOR SALE

JEFFREY 76-AM COLMOL, mechanical drive, 250 Volts, DC, 10 arm upper head, equipped with split-flow pumps for 1/8 faster penetration and trimming.

JEFFREY 15-ton LOCOMOTIVE, 36" gage 80" wheel centers, height over rail, 38", equipped with dynamic braking.

Equipment located in Indiana County, Central Pennsylvania.
FB 5135 Coal Age
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

11 RU Cutting Machine
1-14 BU Joy AC Loader
2-512 Goodman Machine with Duster DC
3-312 Goodman Machines 7 1/2" & 8 ft. Bar
2-212 Goodman Cutting Machine
1-351 Jeffrey Cutting Machine
1-11B Sullivan Cutting Machine
1-600 Ton Bin
1-T2-SAFE Cat Truck
1-Gasoline Hoist Practically new
1-Joy Aerdyne Fan

ROTARY CONVERTERS

3-750 KW 600 volt 1200 RPM Westinghouse Serial Number over 8 Millions Fabricated Based
1-500 KW 600 volt 1200 RPM General Electrical
2-500 KW Westinghouse 250/275 volt 1200 RPM
2-300 KW G.E. HCCS Form P 1200 RPM
1-200 KW Allis Chalmers Rectifier
2-200 KW G.E. HCCS Form P 1200 RPM
1-100 KW G.E. HCCS Form P 1200 RPM
2-100 KW Westinghouse 1200 RPM
Transformers any voltage for above switching gear, & panel mounting, ITE circuit breaker, hoist, etc.
J. M. ALLARA CO.—JAEGR, W. VA.
WELLS—88072 Shop WELLS—82156 or 82470 Night

PROFIT FROM LOW RANK COALS

Foreign consulting metallurgist (California resident, top U. S. references) has perfected an efficient method and devised a simplified apparatus to treat economically low rank coals. Outstanding advantages over present ovens and techniques. Low cost equipments and maintenance. Very high throughput rates. All products and by-products have expanding outlets. Makes low rank coals suitable for iron-making. Easy installation, flexibility, safety. Will consider a consulting assignment with American or foreign interests able to make the best of these works. Principals only.

BOX 5158 Coal Age

1125 W. 6th Street, Los Angeles 17, Calif.

**Faster
From
Foster**

Nation's Largest Warehouse Stocks

**RAIL AND TRACK
MATERIAL**

PIPE, VALVES, FITTINGS

L. B. FOSTER CO.

Pittsburgh 30 • New York 7 • Chicago 4 • Houston 2
Los Angeles 5 • Atlanta 8 • Cleveland 35

FOR SALE OR LEASE

70 All Steel

TWIN HOPPER CARS

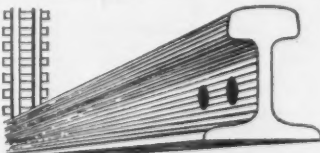
60 Ton Capacity

Fully Repaired
Immediate Shipment

'Phone — Wire — Write

HYMAN-MICHAELS COMPANY

108 N. State Street Chicago 2, Ill.
'Phone: DEarborn 5-5422



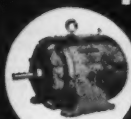
**RELAYING • NEW RAILS
TRACK MATERIALS**

MIDWEST STEEL CORP.

612 DRYDEN STREET
CHARLESTON 21, W. VA.

**POWER EQUIPMENT CO.
Offers**

**BARGAIN
PRICES**



ON GUARANTEED
NEW and Rebuilt
MOTORS!

Sept. Specials

GUARANTEED REBUILT MOTORS
230 Volt DC Compound Wound
Unless Otherwise Noted

HP	MAKE	TYPE	SPEED
100	West. S.B. Open	SK-142L	1800
100	West. S.B. Open	SK-170	900
75	Burke S. B. Drip	WA-4	1800
75	West. S.B. Open	SK-140L	1800
75	West. S.B. Open	SK-160	900
60	G.E.B.B. Drip	CDM-95	1800
60	Al. Chal. S.B. Drip	DE-131	1200
100	C.W. T.E.F.C. B.B.	53HFC	900
40	Century B.B. Drip-New	DN375	1800
50	West. B.B. Drip New	SK-93	1800
25	West. S.B. Open	SK-100L	1200
25	G.E.B.B. Shunt	CD-93	1200
10	G.E.B.B. Splash	CD-85	1800
10	West. B.B. Drip	CSP-324	1800
7 1/2	G.E.T.E.F.C. B.B. New	B-284	1800
5	L.A.B.B. Drip	OGNA-254	1800

Send for our FREE Catalog

Cash for your surplus new &
used electric equipment.
Send your list today.

Large line of motors, control equipment, AC
& DC Generators, MG sets and transformers.

Phone or Wire Us Collect



POWER EQUIPMENT CO.

8 Cairn St., Rochester 2, N. Y.
Phone BEverly 5-1662

HEAVY EXCAVATION EQUIPMENT

DRAGLINES, SHOVELS, CRANES, DRILLS, TRUCKS

15-W B.E. Elec. Drag, 215', 12 yd.
450-W B.E. Diesel Drag, 165' w/extra 10, 12, 13
& 14 yd. buckets.
9-W B.E. Elec. Drag, 165', 10 yd.
9-W B.E. Diesel Drag, 165', 12 yd.
7-W B.E. Diesel Drag, 140', 7 yd.
7400 Marion Diesel Drag, 175', 13 yd.
71-B B.E. Crane with 160' boom
825 Page Diesel Drag, 150', 10 yd.
1855 P&H Diesel Drag, 130', 10 yd.
621-S Page Diesel Drag, 125', 7 yd.
200-W B.E. Diesel Drag, 125', 6 yd.
2400 Lima Elec. Drag, 130', 6 yd.
2400 Lima Diesel Drag, 130', 6 yd.
4500 Manitowoc Drag, 120', 5 yd.
120-B B.E. Elec. Drag, 115', 5 yd.
111-M Marion Drag, 100', 4 yd.
1055 P&H Diesel Drag, 80', 4 yd.
1601 Lima 4 yd. Shovel/Drag
3900, 3500 & 3000 Manitowoc Cranes
3560 Marion 28 yd. Elec. Shovel
190-B B.E. 8 yd. Elec. Shovel
1600 P&H 6 yd. Elec. Shovel
170-B B.E. 6 yd. Elec. Shovel
4161 Marion 6 yd. Elec. Shovel
2400 Lima 6 yd. Std. & H.L. Shovels
120-B B.E. 4 yd. Elec. Shovel
4500 Manitowoc 5 yd. H.L. Shovel
1055 P&H 3 yd. H.L. Shovel
1201 Lima 3 1/2 yd. Standard Shovel
111-M Marion Standard & H.L. Shovels
3500 Manitowoc Standard & H.L. Shovels
54-B B.E. Standard & H.L. Shovels
Model T-650 REICHdrill Truck Mtd, Rotary &
Down-The-Hole
Ingersoll-Rand Truck Mtd. & Crawler Mtd. Drill-
masters
Keystone 250 Truck Mtd. Stardrill
McCarthy & Compton Coal Auger Drills
Euclid Trucks, Dozers, Attachments, etc.

FRANK SWABB EQUIPMENT CO., INC.

313 Hazleton National Bank Bldg.
Hazleton, Pa., GLadstone 3-3638

NOT RUNNING FOR PRESIDENT!

The promises we make are not based on politics—you can believe every word: We'll buy any quantity of Mining Equipment or complete Mines including Railroads at any time you want to sell and at fair prices always. We'll sell anything for the efficient mining of coal from one part to an entire mine, including tipples, and guarantee to save you money.

WE OWN WHAT WE ADVERTISE

JOY EQUIPMENT—REBUILT

- 6-Joy 14BU 9AE—26" Hi-new 1958.
- 3-Joy 14 BU Loaders, low pedestal, 7AE, 1956 & 57.
- 6-Joy 14 BU Loaders, medium pedestal, 7RBE.
- 1-Joy 14BU 7CE high pedestal loader.
- 1-Joy 14BU 3PE Loaders.
- 2-12BU10E Joy Loaders complete with Piggybacks.
- 2-Joy 12BU Loaders, 9E, latest type. 250 V. DC.
- 2-Joy 12BU Loaders, 220/440 V. AC.
- 1-Joy 20BU Loader, latest type.
- 4-Joy 11BU Loaders, latest type.
- 1-Joy 8BU Loader, 34" overall height.
- 2-Joy 8BU Loaders, 220 V. AC.
- 1-Joy curved Bar Head, complete.
- 6-Reliance 24-J Motors, 7½ H.P.
- 4-Reliance 38-J Motors, 10 H.P.
- 20-9-J Motors, 4 H.P.
- 2-Goodman 660 Loaders on Crawlers 440 V. AC, like new.
- 1-Goodman 660 Loader on Crawlers, excellent 250 V. DC.
- 1-Goodman 665 Loader on Crawlers, latest type 250 V. DC.
- 1-Goodman 865 Loader, 26" hi. Rebuilt. 250 V. DC.
- 4-Joy 8SC Shuttle Cars, rebuilt.
- 4-Joy 6SC Shuttle Cars, rebuilt, latest type.
- 1-Joy 5SC Shuttle Car, Excellent.
- 2-Joy 32E9 Shuttle Cars.
- 2-Joy 32E10 Shuttle Cars, rebuilt.
- 2-Joy 32E15 Shuttle Cars, rebuilt.
- 4-Joy 32E16 Shuttle Cars, rebuilt.
- 10-Joy 42E16 Shuttle Cars, rebuilt.
- 2-Joy CO-22 Drills, on rubber, like new.
- 6-Joy T-2.5 low pan Crawler Trucks, rebuilt.
- 1-Joy T-2.6 low pan Crawler Truck with reel.
- 1-Joy T-1 Standard Crawler Trucks, 220 AC.
- 1-Joy T-1 Standard Crawler Truck, 250 DC.
- 2-Goodman low pan Crawler Trucks, like new, latest type.
- 4-Joy 11-B Cutting Mach., like new, 35 & 50 H.P.
- 1-Joy 7-B Cutting Machine, like new, 250 V. DC.
- 2-Goodman 212 Cutting Machines, 19" high.
- 4-Goodman 312 Cutting Machines, 17" high.
- 3-Goodman 412 Cutting Machines, 19" high.
- 1-Goodman Machine on Crawler, 31" high. All hydraulic.
- 6-Goodman 512 Machines with Bugbusters.
- 6-Goodman 612 Cutting Machines, 250 and 500 volt.
- 1-Lee Norse low vein Machine Carrier on rubber.
- 1-Jeffrey 70 URB rubber tired Cutter, Universal head, perfect condition.
- 1-Goodman 2410 Rubber Tired Cutter, Universal head, like new.
- 3-Joy 11RU Rubber Tired Cutters with bugbusters, 11RU heads, dual tires, like new, 250 V. D.C.
- 2-Joy 10RU Rubber Tired Cutters, Universal head, 220/440 V. A.C. Perfect.
- 4-Joy 10RU Rubber Tired Cutters, Universal head, 250 V. D.C.
- 7-7AU's on track, Universal head.
- 2-Jeffrey 29UC Cutting Machines, Universal head, cuts anywhere in seam, 38" high, on Crawlers, 250 volt D.C.
- 1-Jeffrey 29LC on Crawlers, rebuilt.

LOCOMOTIVES

- 1-Goodman 6 ton, 93-A, 27" high, armor plate frame.
- 1-Jeffrey 15 ton MH-77 Locomotive, armor plate frame.
- 3-Jeffrey, 13 ton, type MH-110, 36", 42", 44" ga.
- 2-Jeffrey, 10 ton, type MH-110, 42" and 44" ga.
- 2-Jeffrey, 10 ton, type MH-78, 42" and 44" ga.
- 2-Goodman 8-30 and 10-30 Locos., 26" above rail.
- 1-Jeffrey MH-121, 4 ton, like new, with reel, 24" overall height.
- 2-Jeffrey MH-150, 6 ton, 26" overall height, rebuilt, with reel.
- 12-Jeffrey, 6 ton, type MH-88, 42", 44" and 48" ga.
- 4-Jeffrey, 8 ton, type MH-100 2½" armor plate frames.
- 1-Jeffrey, 6 ton, type 2186, 22" above rail.
- 3-Jeffrey, 4 ton, type MH-96, 42", 44", 48" ga.
- 1-G.E., 4 ton, type 825 Locomotive, 22" high.
- 10-G.E., 6 ton, types 801, 803, 821 Locomotives, 42", 44" and 48" ga.
- 1-G.E., 8 ton, type 822 Locomotive, 44" ga.
- 3-G.E., 10 ton, type 809 Locomotives, 42", 44" and 48" ga.
- 2-G.E. 13 ton, type 829 Locomotives, armor plate frames.
- 1-Goodman 91A Locomotive, 8 ton, 26" overall height.
- 2-Goodman, type 33, 6 ton, 44" and 48" ga.
- 3-Westinghouse, type 902, 4 ton, 42" and 48" ga.
- 2-Atlas Battery Locomotives 36" ga.

- 1-Atlas Trolley Locomotive, 4 ton, 24" high.
- 1-Ironton Battery Locomotive, 4 ton, 24" high, excellent, with charger.
- 2-Westinghouse, type 904, 6 ton, 44" and 48" ga.
- 2-Westinghouse, type 906, 44" and 48" ga.
- 2-Westinghouse, type 907, 10 ton, 44" & 48" ga.
- 8-Jeffrey MH-78 Locomotive Units, cheap.
- 4-Jeffrey MH-88 Locomotive Units, real bargains.
- 6-Jeffrey MH-100 Locomotive Units, reasonable.
- 3-Plymouth Diesel Locomotives, 8 and 10 tons, 42" and 44" ga.

Locomotive Trucks & Spare Armatures for the above.

TIPPLE EQUIPMENT

- 1-All Steel 5 Track Tipple, new 1957, complete with waster, silo, oil treating system, all bolted construction.
- 1-Complete Five Track Tipple with Washers and Air Tables.
- 1-Complete stoker plant, all steel.
- 2-Complete Tipples, 3 & 5 track, steel and wood.
- 3-Cleaning Plants, 1 Ea. McNally, Roberts and Schaefer, Jeffrey Washers and Air-Fluo Tables.
- 4-Complete Aerial Trams for coal or refuse.
- 3-Complete Rope and Button Lines.
- 2-Monitor Lines complete with Drums, excellent.
- 1-Allis-Chalmers 5' x 12' Rippflo Vibrator.
- 1-Allis-Chalmers 4' x 12' Low-Head Vibrator.
- 1-Robins Gyrex Vibrator, 4 x 10.
- 10-Belt and Apron type Loading Booms.
- 6-Shaker Screens.
- 1-Robins Car Shakeout.
- 20-Crushers, various sizes—Jeffrey, McLanahan & McNally.
- 4-Mine Scales, 10 & 20 ton.
- 5-Truck Scales, 25 to 40 ton, late type.

Feeders, Belt and Drive Conveyors, Car Retarders.

CUTTING MACHINES

- 2-Joy 10RU Rubber Tired Cutters, Universal head, 220/440 volt A.C. Perfect.
- 4-Joy 10RU Rubber Tired Cutters, Universal head, 250 V. D.C.
- 3-Joy 11RU Rubber Tired Cutters, 250 V. D.C.
- 1-Goodman 2410 Rubber Tired Cutter, Universal head, new 1956, Excellent.
- 2-Jeffrey 29UC Universal Machines on Crawlers.
- 1-Goodman on Crawlers, 31" overall height.
- 3-Baby Goodman 212's, rebuilt, 250 V. D.C.
- 7-Goodman 212 Cutting Machines, 19" high.
- 4-Goodman 312 Cutting Machines, 17" h. gh.
- 3-Goodman 412 Cutting Machines, 19" high.
- 4-Goodman 512's, with Bugbusters, like new.
- 4-Goodman 512's, rebuilt, or as removed from service.
- 6-Goodman 612's—250 & 500 Volt.
- 3-Goodman 112's, 220/440 V. A.C.
- 1-Joy 7-B Cutting Machine, 250 V. D.C.
- 4-Joy 11B Cutting Machines, rebuilt, 35 & 50 H.P.
- 6-7AU's, on track, Universal Head.
- 10-Goodman 12AA's and 12AA's, 250 V. D.C.
- 2-Goodman 324 Slabbers.
- 2-Goodman 724 Slabbers.
- 2-Goodman 824 Slabbers.
- 2-Jeffrey 35L's, like new, 17" high.
- 2-Jeffrey 35L's, on low vein trucks.
- 2-Jeffrey 35L's, 220/440 A.C.
- 3-Jeffrey 35BB's, 220/440 A.C.
- 15-Jeffrey 35B's and 35BB's 250 V. D.C.
- 2-Jeffrey 29B's on track.
- 10-Jeffrey 29C's, track mounted.
- 2-Jeffrey 29L's, on Crawlers, Excellent.
- 1-Sullivan CE7, 220/440 V. A.C.

CONVEYORS

- 1-Robins 36" tandem drive with or without structure.
- 2-Jeffrey 52-B tandem drive 30" Belt Conveyors, 1,500'.
- 1-Jeffrey 52-B tandem drive 26" Belt Conveyor.
- 1-Joy 30" Underground Belt Conveyor, Excellent.
- 1-Goodman 97-C, 30" tandem drive.
- 1-Goodman 97-C, 26" Conveyor, 1,000' long.
- 1,200' Robins 36" Underground Structure, like new.
- 1,000' Conveyor Belt, 42".
- 4,000' Conveyor Belt, 36".
- 4,000' Conveyor Belt, 26".
- 8-Jeffrey 61AM 12" Chain Conveyors, 300'.
- 2-GIEW Elevating Conveyors.
- 2-61WM 15" Room Conveyors, 300'.
- 2-Joy 15" Room Conveyors, 300'.
- 2-Joy 20" Conveyors, 300'.
- 4-Joy Ladel UN-17 Shakers.
- 10-Goodman G-12½ and G-15 Shakers.
- 1,000' Goodman 18" Flat Belt Conveyors, tandem drive any length, Perfect.

CONVERTERS AND DIESEL PLANTS

- 1-300KW Portable Rectifier, 3 car unit, excellent.
- 2-500KW G.E. Stationary Rectifiers.
- 4-1,000KW Stationary Rectifiers.
- 2-100KW, G.E. TCC-6's, 275 V., Rotary Converters.

- 1-150KW, G.E. HCC-6, 275 V. Rotary Converter.
- 1-150KW, 6 phase, Allis-Chalmers Rotary Converter, 275 V. D.C.
- 2-200KW G.E. HCC-6's, Rotary Converters, 275 V. D.C. Steel frames. Newly rewound.
- 3-300KW G.E. HCC-6's, Rotary Converters, 275 V. D.C. Like New.
- 2-300KW Westinghouse, 6 phase, Rotary Converters, 275 V. D.C.
- 2-500KW West Rotary Converters, 275 V. D.C.
- 2-200KW Westinghouse Rotary Converters, 275 V. D.C. Newly rewound.

(All the above with 6900/13000 and/or 2300/4000 primary transformers)

LOADING MACHINES

- 15-Joy Loaders, 14BU, 12BU, 8BU, 11BU, 20BU.
- 5-Joy 12BU9E Loaders, 220/440 V. A.C. Excellent.
- 3-Joy 12BU9E Loaders, latest type.
- 2-Joy 12BU with Piggyback Conveyors.
- 2-Goodman 865 Loaders, 26", on Crawlers.
- 1-Goodman 665 Loader, on Crawlers, rebuilt.
- 2-Goodman 660 Loaders, 440 V. A.C. perfect.
- 1-Goodman 660 Loader, on Crawlers, 250 V. D.C.
- 1-Goodman 460, on track, rebuilt, all hydraulic.
- 2-Jeffrey 61 CLR's on rubber, 26".
- 3-Jeffrey L-500 Loaders.
- 2-Myers Whaley, No. 3 Automatic Loaders.
- 2-Clarkson Loaders, 26" above rail.

MISCELLANEOUS

- 1-Complete Five Track Tipple with Washers and Air Tables.
- 5-Complete Tipples, 3 to 5 Track. Wood and Steel. Steel Trestles for drop bottom cars.
- 20-Jeffrey Moleys on rubber tires.
- 1-¾ Yard Shovel and Back-Hoe.
- 1-¾ Yard Crawler Crane.
- Battery Supply Tractors, Rubber Tired.
- 1-Cantrell Air Compressor on rubber tires.
- 10-Air Compressors, 1 H.P. to 40 H.P.
- 2-Joy self-propelled rubber tired comp., 240 cu. ft.
- 2-Acme self-propelled rubber tired compressors, 130 cu. ft.
- 40-Mine Pumps, all types.
- 1-Differential 40 Passenger Man-Trip Car.
- 6-MSA Rock Dusters.
- 2-Phillips Carriers, 44" and 48" ga.
- 1-Barber-Greene self-propelled Bucket Elevator.
- Pine, Plastic, Steel, Transit, all sizes 1" to 6".
- 300-Mine Cars, drop bottom, 42" ga.
- 90-Mine Cars, drop bottom, 44" ga.
- 50-Mine Cars, drop bottom, 48" ga.
- 100-Mine Cars, 18" high, end dump, 44" ga.
- 300-Mine Cars, end dump and drop bottom, 20" high, 48" ga.
- 1-10 ton Mine Car Scale with Recorder.
- 15-Brown Fayro HXL and HG Car Spotters.
- 1-Brown Fayro Hydraulic Car Spotter.
- 1-12 ton Differential Slate Lorry.
- Incline Hoists, 25 to 50 H.P.
- 1-Jeffrey 5' Aerodyne Fan, like new.
- 1-Jeffrey 6' Aerodyne Fan.
- 2-Storage Tanks, 4,000 Gallons.
- 2-Storage Tanks, 10,000 Gallons.
- 10,000 Five Gallon G.I. Cans, screw lids.
- 2,500 tons Relaying Rail, 25lb., 30lb., 40lb., 50lb., 60lb., 70lb.
- 30 Tons Copper—4/0 and 9 Section Trolley 1/0, 2/0, 4/0 Stranded.
- Thousands of feet of rubber covered three conductor cable. All sizes.
- 300-Transformers from 1 to 300 KVA, 110 to 13,000 primary volts.
- 400-Electric Motors, 3 to 250 H.P.
- Huge Stock of Mine Supplies.
- 600-MSA Mine Lamps, Chargers, etc.
- 4-Mine Scales, 10 & 20 ton.
- 5 Truck Scales, 25 to 40 ton, late type.
- Mack & International tandem dump trucks.

THOUSANDS OF OTHER ITEMS

WE BUY - SELL - TRADE

J. T. FISH

LOGAN, WEST VA.

PHONE PL 2-4400

MOUNTAIN STATE EQUIPMENT COMPANY

HAS PURCHASED THE ST. ELLEN MINE OF PEABODY COAL COMPANY, O'FALLON, ILLINOIS, LOCATED ON U. S. ROUTE 50, APPROXIMATELY FIFTEEN MILES EAST OF ST. LOUIS, MISSOURI. THE ENTIRE STOCK OF EQUIPMENT AND APPROXIMATELY 400 ACRES OF LAND ARE BEING OFFERED FOR SALE AT BARGAIN PRICES.

J. J. MAHONEY AND ROY FAIRCHILD CAN BE CONTACTED AT MINE SITE AT ALL TIMES.

P. O. Box 150
O'Fallon
Illinois

Phone: M ERcury 2-3621
M ERcury 2-3622
M ERcury 2-3623
Night Phone: M ERcury 2-5887

THE FOLLOWING IS A PARTIAL LISTING OF EQUIPMENT FOR SALE AT THE MINE SITE

Shuttle Cars, 250 Volts DC

- 11—Joy 10SC Shuttle Cars, right and left hand drive.
- 3—Joy 42-D Battery Shuttle Cars complete with batteries and chargers.

Cutting Machines, 250 Volts DC

- 5—10RU Joy Cutting Machines
- 5—324 AA Goodman Slabbers—Track Gauge 42"

Trolley Locomotives, 42" Track Gauge for 250 Volts DC

- 2—Goodman 20 ton 81A-42-108T with 3—120 H.P. Motors, completely modern.
- 1—13 ton Goodman—Type 81A04T, completely modern.
- 1—Goodman 13 ton 136B-0-4-6 with 2—75 H.P. Motors.
- 2—13 ton Jeffrey Locomotives, (1—inside frame and 1—outside frame)
- 1—Goodman 5 ton 3013 with 1—50 H.P. Motor.
- 4—8 ton 132AK42-48R Goodman with 2—50 H.P. Motors with reels.
- 1—8 ton 32-0-4-T Goodman with 2—50 H.P. Motors with reels.
- 1—8 ton LM2-8-T.D.D General Electric with 2—50 H.P. Motors with reel.
- 3—6 ton LM2-T-GMM General Electric with 2—35 H.P. Motors with reel.
- 2—6 ton LM2-4-6-11 General Electric with 2—35 H.P. Motors with reel.

BATTERY LOCOMOTIVES, 42" Track Gauge

- 18—Greensburg Monitors complete with charging equipment and batteries.
- 8—Mancha Locomotives complete with charging equipment and batteries.

Loading Machines, 250 Volts DC

- 9—11BU Joy Loading Machines, completely modern with separate pump motors.
- 6—360 Goodman Loading Machines.

Motor Generator Sets

- 8—General Electric 300 KW Motor Generator Set, 1200 RPM, primary voltage 2300/4160, 275 Volts DC Complete with panel boards.
- 5—General Electric 200 KW Motor Generator Sets, 1200 RPM, 2300/4160 primary voltage, 275 Volts DC Complete with panel boards.
- 3—Westinghouse 200 KW Motor Generator Sets, 1200 RPM, 2300/4160 primary voltage, 275 Volts DC, complete with panel boards.
- 3—Westinghouse 150 KW Motor Generator Sets, 1200 RPM, 2300/4160 primary voltage, 275 Volts DC, complete with panel boards.

Conveyors

- 5—Joy PL 11 Elevating Conveyors
- 6—Joy PL 11 Side Dumps

Belt Conveyors

- 1—Hewitt Robins Slope Conveyor, 980 ft. long, 42" wide, equipped with 200 H.P., 440 Volt AC Drive (also 50 H.P. Volt AC Motor for man trip), complete with 42" x 6 ply Rubber Conveyor Belt, Amax Raynile #130/4" top cover and 1/16" bottom cover with Nylon Breaker.
- 3,128 feet of Jeffrey 36" wide structure in 8 ft. sections.
- 2,296 feet of Joy 36" wide structure in 8 ft. sections.
- 10,848 feet of Rubber Belt 36" wide
- 3—40 H.P. Goodman 36" Belt Drives with Tail, 250 Volts DC.
- 1—Robins Belt Conveyor 36" wide, 150 ft. long complete with Allis Chalmers, 30 H.P., 220/440 Volt AC Drive.

MINE CARS

- 100—AC&F, Three-Door Drop Bottom Mine Cars, 48" High, 17 ft. 7 1/4 in. overall length, capacity 271 cubic feet level full, 42" gauge.
- 100—Sanford Day Three-Door Drop Bottom Mine Cars, 36" High with an 8" sideboard, 16 ft. 10 1/2" overall length, 42" gauge.

WIRE MATERIAL

- 21,400 ft.—4/0 Round Return Wire
- 8,600 ft.—500,000 CM
- 50,000 ft.—1,000,000 CM
- 82,600 ft.—6/0 Trolley Wire
- 8,000 ft.—4/0 Rubber Covered 4000 Volt Feeder Cable.

TRACK MATERIAL

- 64,800 ft.—40# Track
- 154—40# Switches
- 10,800—40# Ties
- 100,400 ft.—60# Track
- 51—60# Switches
- 7,000—60# Ties

COMPLETE FOUR-TRACK TIPPLE CAPABLE OF HANDLING 10,000 TONS OF COAL PER DAY

- Partial List of Major Items of Tipple:
- Sizes of coal: from 1/4 x 0 to 7 x 4" Block
- CMI 48" Dryer—complete with motors, drives, belt, etc. screen cloth 1/16" opening, capacity 90 ton per hour.
- 1—Coppus Ventair Blower #24708.
- Pulverizers: (American Pulverizers) 4—#305, Ser. #3218—AC3, Serial #1798, AC3B, Ser. #3127, WC-24, Ser. #3240.
- 5—8x6 Allis-Chalmers Centrifugal Pumps, complete with motors (4) breakers.
- 1—16x14 Allis-Chalmers Centrifugal Pump, complete with motor, starter, breakers.
- 1—Roberts & Schaefer Electric Vibrator.
- Consists of Belt & Chain Conveyors complete with motors, drives, 36" Belt also some 24x30" Belt.
- 1—Roberts & Schaefer Air Drying Plant (specifications furnished on request)

WELDERS

- 3—Lincoln, 300 amp. M.G. Sets
- 2—Hobart 300 amp. M.G. Sets
- 1—G.E. 400 amp. M.G. Set
- 4—Guyan 200 amp. Resistance Welders

AUTOMATIC RECLOSING BREAKERS

- 4—1600 amp. I.T.E. Modern with reverse current relay.

AIRDOX EQUIPMENT

- 5—Armstrong 60 H.P., AC 440 Volt Compressors
- 5—Armstrong Coal Breakers, Model EB-301.
- 5—G. E. Motors 60 H.P. Type K, Frame 504, 220/440 Volt AC, 1180 RPM.
- Auxiliary equipment and controls complete with 16,100 feet of Airdox Pipe.

PORTAFEEDEE

- 1—Nolan Portafeeder.

COAL DRILLS

- 5—Manson Trucks—10 H.P., DC Tram Motors on 4 7/8 H.P. DC Tram Motors on 1, Joy 9 J Motor with Reduction on 1. Each drill truck has 2 drill arms with 2 Chicago Pneumatic 580 Drills 7 1/2 H.P., DC.
- 3—Manson Track Trucks, each truck with 2 drill arms & 2,580 Drills.
- 2—Manson Track Trucks, without drills.
- 9—Dooley Rubber Tired Drill Trucks, equipped with two arms and two 580 drill motors.

ROOF DRILLS

- 1—Joy RBD-7 with 15 HP Reliance Permissible DC and mounted on Manson w/h 7 1/2 H.P. Westinghouse on Rubber.
- 1—Jeffrey 56 R.D. with 15 H.P. Motor DC, arm is mounted on Manson Track Truck.
- 1—Dooley (Rubber Tired) Drill Truck, equipped with Vertical Drilling 580 Drill Motors.

ROCK DUSTERS

- 1—American Mine Door Road Cleaner
- 2—MSA Rock Dusters, 25 H.P. Track
- 3—MSA Bantam Rock Dusters, 2 H.P.

TRUCKS

- 4—(Shop Built) Mobile Repair Trucks
- 4—Personnel Jeeps, 42" Track Gauge.

FANS

- 1—Jeffrey Aerodyne Fan, Serial No. 8687 complete with G. E. 100 H.P., 440 Volt AC Motor and Auxiliary Ford Industrial Power Unit gasoline driven.
- 1—4 ft. Jeffrey Aerodyne Fan complete with 60 H.P., 220/440 Volt AC Motor and Auxiliary Ford Industrial Power Unit gasoline driven, complete with all necessary equipment and controls.

TRANSFORMERS

- 3—2400/4160 V., 240-480 Volts, 100 KVA General Electric Single Phase Transformers.
- 3—2400/4160 V., 240-480 Volts, 333 KVA General Electric Single Phase Transformers.
- 3—2300/4160 V., 230-115 Volts, 200 KVA General Electric Single Phase Transformers.
- 3—2300/115/230 Volt, 15 KVA General Electric Single Phase Transformers.
- 3—50 KVA, 2300/4160 V., 240/480 Volt General Electric Single Phase Transformers.

SUPPLY HOUSE

- Complete inventory of new parts for 10SC, 10RU and 11BU Joy Equipment plus cable, tools, hardware, etc. for operation of mine.

BATHHOUSE EQUIPMENT

- 355—Baskets with Chains, 20 shower heads and complete equipment for operation of bathhouse.

LAMP HOUSE

- 360—R4 Cap Lamps complete with necessary charging equipment.
- 25—Flame Safety Lamps

MOBILE EQUIPMENT

- 1—Koehring Heavy Duty Crane—C5521.
- 1—Shovel Dipper Stick for same—Size 301, Serial No. 61, Length 16 feet—3/4 yard dipper
- 1—Hais Field Loader, Model 75WSBC, Serial No. 726, 11/6" Conveyor, Serial No. K8644.
- 1—International 1950 Flat Bed Truck Tandem with steel bed and wench, Ser. #3438, 3 axles, weight 18,500 lbs.
- 1—Haugh Pay Loader, Model HF and HFN, Serial No. 81221
- 1—Allis Chalmers Tractor HD9-B27
- 1—Allis Chalmers Tractor Hi Lift, Model HDS, Model #24-27482, Serial No. 22246.
- 1—Caterpillar Tractor D6, 60" Gauge, Serial No. 5R4778.
- 1—Whiting Track Mobile, Serial #TM-209.
- 1—Roller—W. M. Bros. Boiler Mfg. Co., Model 678, Ser. #RR-2734, weight 3950 lbs.

COMPLETE SHOP AND OFFICE EQUIPMENT

- STATIONARY MOTORS
- AC and DC Motors ranging from 1 to 300 H.P.

GENERAL MISCELLANEOUS

- Hundreds of other items such as pump, motors, armatures, locomotive trucks, wheel units, hydraulic pumps, conveyor chains, cat chains, tippie drag lines too numerous to list.

MOUNTAIN STATE EQUIPMENT COMPANY

Box 1050, Beckley, West Virginia

Phone CLifford 3-7383

J. J. MAHONEY
Res. Phone CLifford 3-6804, Beckley

WILLIAM R. MONK
Res. Phone CLifford 3-6907, Beckley

R. E. KAMM
Res. Phone 4281, Summersville

ELECTRIC AND MACHINE SUPPLY COMPANY

Largest Supplier of the Best Rebuilt Mining Equipment

CONTINUOUS MINERS

- 1—3 JCM Joy Continuous Miner, 250 V., D.C., Excellent Condition
- 1—Lee Norse Jr. Continuous Miner, 250 V., D.C.

CUTTING MACHINES

- 7—12RB Joy Cutting Machines, 250 V. D.C. Permissible, Dual Wheels, Bug Dusters, 9' Bar, Excellent Condition
- 5—11RU Joy Cutting Machines, 250 V. D.C., Permissible, Bug Dusters, one completely rebuilt
- 1—70URB Jeffrey Cutting Machine, 250 V. D.C., Excellent Condition
- 1—29U Jeffrey Cutting Machine, 220/440 V. A.C., Rebuilt
- 16—512 Goodman Cutting Machines, 250 V. D.C., Hydraulically or Manually Controlled
- 2—512 Goodman Cutting Machines, 220/440 V. A.C.
- 1—824 Goodman Slabber, 250 V. D.C.
- 50—35B and 35BB Jeffrey Cutting Machines, A.C. and D.C.
- 2—35L Cutting Machines
- 6—7AU Sullivan Cutting Machines, 250 V. D.C.
- 5—7B Sullivan Cutting Machines, 250 V. D.C.
- 16—11B Sullivan Cutting Machines, 35 & 50 h.p., 250 V. D.C.
- 19—12AB, 12AA and 12AA Goodman Cutting Machines, 250 V. D.C.
- 9—212AA Baby Goodman Cutting Machines, 250 V. D.C.

BELT CONVEYORS

- 1—36" Joy Model "C" Belt Conveyor, 1,080' centers
- 9—MTB 30 Joy Tandem Belt Conveyors, 1,000' centers, 25, 40 & 50 h.p., one with Scandura Flame Proof Belting
- 860—48" Link Belt Conveyor Structure
- 1—30" 97HC Goodman Tandem Belt Conveyor Drive
- 1—30" Shop Constructed Belt Conveyor Drive
- 288—30" Barber Greene Belt Conveyor Structure
- 8,760—26" Joy Model "C" Structure
- 18—26" Belt Conveyor Drives, various makes

LOADING MACHINES

- 3—11BU Joy Loaders, 250 V. D.C.
- 5—8BU Joy Loaders, A.C. & D.C.
- 4—14BU-7RAE Joy Loaders, 250 V. D.C.
- 1—14BU-7BE Joy Loader, 250 V. D.C.
- 4—14BU-3PE Joy Loaders, 250 V. D.C.
- 7—14BU-2E Joy Loaders, 250 V. D.C., 28" O.H.
- 3—12BU-9E Joy Loaders, 250 V. D.C., rebuilt
- 5—20BU Joy Loaders, 250 V. D.C., Permissible
- 1—Whaley #3 Loading Machine, 42" t.g., Permissible, 3 years old, Excellent condition
- 1—360 Goodman Loader, on rubber, 250 V. D.C.
- 5—Long 88 Pig Loaders, 250 V. D.C.
- 1—24BB Clarkson Loader, 250 V. D.C.

SHUTTLE CARS

- 8—60E-10 Joy Shuttle Cars, w/Elevators, matched pairs, 250 V. D.C.
- 10—42E Joy Shuttle Cars, 250 V. D.C.
- 5—SSC Joy Shuttle Cars, w/Elevators, 250 V. D.C.
- 20—6SC Joy Shuttle Cars, matched pairs, 250 V. D.C.
- 4—SSC Joy Shuttle Cars, Elevating Discharge Permissible Plates, Excellent Condition, 250 V. D.C.

- 21—32E-10 & 32E-16 Joy Shuttle Cars, Excellent condition, 250 V. D.C.

- 2—MT66-A45 Jeffrey Shuttle Cars, 250 V. D.C., matched pair, Excellent Condition

MISCELLANEOUS TRACKLESS EQUIPMENT

- 1—WK-83R Joy Compressor, 240 cu. ft.
- 1—WL-82 Joy Compressor, 125 cu. ft.
- 7—T2-SAE & T2-2E Joy Machine Trucks
- 2—TL-46 Joy Machine Trucks, 220 V. A.C.
- 1—Lot 9J, 10J, 23J & 24J Motors

PREPARATION EQUIPMENT

- 1—4 Cell Jeffrey Baum Jig Washer, complete, 300 t.p.h. capacity
- 1—Simon Carver Heavy Duty 2 Compartment Baum Jig, 400 t.p.h. capacity

- 1—Daniels Heavy Media Washer
- 1—48" CMI Centrifugal Dryer, Excellent
- 1—Heat Dryer, complete
- 1—36" x 130" Hot Material Handling Belt, Excellent
- 4—7' x 15' Single Deck Diester tables
- 1—36" x 36" Jeffrey Single Roll Crusher
- 1—36" x 33" Marion Double Roll Primary Crusher
- 1—30" x 36" Jeffrey Double Roll Crusher, Like New
- 1—30" x 30" Link Belt Double Roll Crusher
- 1—24" x 50" Pa. Single Roll Crusher
- 2—24" x 24" Jeffrey Single Roll Crushers
- 1—2' x 4' Williams Pulverizer
- 1—18" x 24" McClanahan Stone Single Roll Crusher
- 1—18" x 12" Jeffrey Swing Hammer Pulverizer
- 1—6' x 16' Allis Chalmers Double Deck Low Head Vibrator
- 1—6' x 14' Single Deck Allis Chalmers Low Head Vibrator, Like New
- 1—5' x 16' Triple Deck Allis Chalmers Ripl-Flo Vibrator, Like New
- 1—5' x 16' Single Deck Allis Chalmers Low Head Vibrator, Like New
- 2—5' x 12" Allis Chalmers Single Deck Low Head Vibrators
- 1—5' x 12" Allis Chalmers Ripl-Flo Double Deck Vibrator
- 1—5' x 10' Double Deck Robbins-Gyro Vibrator, Like New
- 1—4' x 12" Hewitt Robbins Vibrex Screen, Triple Deck
- 1—4' x 10' Selectro Double Deck Vibrator
- 5—4' x 7" Jeffrey Traylor Double Deck Vibrators
- 2—4' x 7" Jeffrey Traylor Single Deck Vibrators
- 1—3' x 14" Single Deck Gyro Vibrator
- 2—3' x 8" Low Head Vibrators
- 1—30" x 72" Jeffrey Traylor Double Deck Vibrator
- 1—2' x 5" Lecco Single Deck Vibrator
- 1—2' x 5" Selector Double Deck Vibrator
- 9—24" x 90" Jeffrey Traylor Vibrators, w/M.G. Sets
- 2—Magnetic Separators, Complete
- 1—Set Jeffrey Dewatering Screens
- 14—Scraper Conveyors of various sizes
- 14—Drag Conveyors of various sizes
- 1—970' Jeffrey Rope & Button Conveyor
- 13—Boom Hoists from 1 ton to 5 ton

We can construct loading booms and tipple belts in any size

CHAIN & SHAKER CONVEYORS

- 20" Joy Chain Conveyors, A.C. & D.C., Permissible
- 15" Joy Chain Conveyors, A.C. & D.C., Permissible
- 15" Long Chain Conveyors with 400 DBH Mobile Heads or Stationary Drives, A.C. & D.C.
- 12" & 15" Jeffrey Chain Conveyors
- 12" Goodman Chain Conveyors
- PT12 Long Piggyback Conveyors
- PT12-B Long Piggyback Conveyors
- Goodman G12½, G15 & G20 Shaker Conveyor Drives
- Joy Ladel UN17 Shaker Conveyor Drives
- Goodman Power Duckbill & Duckbill Hoists

LOCOMOTIVES

- 4—20 Ton Jeffrey MH88 Locomotives, 42" & 48" t.g.
- 1—15 Ton HME28 G.E. Locomotive, 90 h.p. units, 44" O.H., 48" t.g., Excellent
- 1—14 Ton MH110 Jeffrey, 42" t.g.
- 8—13 Ton Locomotives, 250 V., any gauge
- 1—12 Ton 29B Goodman Locomotives, 40" O.H.
- 1—10 Ton Locomotives, 250 V., any gauge
- 21—8 Ton Locomotives, 250 V., any gauge
- 8—7 Ton Atlas Battery Locomotives
- 1—6 Ton Battery Locomotive, New
- 30—6 Ton Locomotives, any gauge
- 3—6 Ton Jeffrey MH150 Locomotives
- 16—6 Ton MH88 Jeffrey Locomotives
- 10—5 Ton Locomotives, 250 V.
- 18—4 Ton Locomotives, 250 V., any gauge
- 1—4 Ton G.E. Battery Locomotive, 48" T.G.
- 2—4 Ton Mancha Battery Locomotives, 48" T.G.

SUB STATIONS & TRANSFORMERS

- 1—Westinghouse A.C. Sub Station, 4500 KVA, 6900/2300, complete w/boards, Excellent
- 4—300KW M.G. Sets
- 5—200KW M.G. Sets

- 4—200 KW, HCC-6-1200 G.E. Rotary Converters, Automatic
- 5—150KW G.E. Rotary Converters, w/Transformers
- 1—150KW Westinghouse Rotary Converters, Completely Automatic
- 19—150KW M.G. Sets of various makes and voltages
- 2—100KW M.G. Sets
- 1—100KW Westinghouse Generator, 250 V., D.C. connected to Buda Diesel Engine, complete w/boards.
- 2—100KW Generators w/671 G.M. Diesel
- 1—100KW Generator w/UD1091 International Diesel
- 1—90KW Generator w/671 G.M. Diesel
- 1—75KW Generator w/10019 Diesel Engine
- 1—75KW Generator w/75 h.p. G.M. Diesel w/ITE Automatic Control Board
- 1—45 KVA Diesel Generator, 110/220 V., 1-3 phase
- 1—100KVA Gasoline Alternator Unit
- 1—50KW M.G. Set, 125 V. D.C., 1200 rpm
- 2—Armatures for 200 KW Rotary G.E., type HCC
- 2—600 & 800 Auto Transformers
- 218—Transformers from 1½KVA to 800KVA
- 1—5KVA A.C. Alternator, 220/440 V., Like New

MINE CARS

- 90—36" t.g. Drop Bottom Cars
- 155—42" t.g. End Dump Cars, various makes
- 260—42" t.g. S. D. Drop Bottom Mine Cars
- 45—42" t.g. A.C.F. Drop Bottom Cars
- 22—44" t.g. Drop Bottom Cars, 10 Ton
- 130—44" t.g. Drop Bottom Cars, various sizes
- 333—44" t.g. End Dump Cars, various sizes
- 327—48" t.g. S. D. Drop Bottom Cars
- 259—48" t.g. A.C.F. Drop Bottom Cars
- 2—56½" t.g., 3 Ton, 4 Wheel Push Trucks

(NEW)

RAIL AND WIRE

- 1,455—Tons, 40, 45, 56, 65, 70, 80, 90 & 100 lb. Relaying Rail
- 325'—2,000,000 CM Bare Copper Feeder Cable
- 550'—1,000,000 CM Insulated Aluminum
- 650'—1,000,000 CM Bare Copper Feeder Cable
- 500'—350,000 CM Copper Feeder Cable, Insulated
- 2,000'—2/0 Stranded Copper, Bare
- 36,670'—2/0 Solid Copper Highline Wire
- 47,000'—1/0 Solid Copper Highline Wire
- 10,345'—#1 Solid Copper Highline Wire
- 10,945'—#2 Solid Copper Highline Wire
- 442'—#4 Solid Copper Highline Wire
- 3,700'—#6 Solid Copper Highline Wire
- 5,825'—4/0 Fig 8 Trolley Wire
- 56,000'—6/0 Trolley Wire
- 1,600'—9 Section Trolley Wire
- 5,000'—2/0, 3 Cond. Anhydrex & Lead Covered Transmission Cable
- 10,000'—#2, 3 Cond. Lead Covered Cable, 5,000 V.
- 6,000'—#1, 3 Cond. Lead Covered Cable, 5,000 V.
- 2,500'—1½" Steel Cable, New
- 600'—1½" Steel Cable, New

MISCELLANEOUS

- 1—Canton Track Cleaner, Excellent
- 19—HKL, HKG, HKD, HKE, HL & CH Brown Fayro & Sullivan Hoists
- 50—Air Compressors of various sizes
- 57—Auto Starters from 3 h.p. to 100 h.p.
- 84—Hoists from 1½ h.p. to 800 h.p.
- 13—Shop Constructed Jeeps, track mounted
- 115—Pumps from ¾" to 4500 GPM
- 9—Hyd. Schroeder Coal Drill
- 1—RBD30 C.P. Roof Drills
- 90—Coal Drills, various makes & sizes
- 1—330 GPM & Pomona Deep Well Pump
- 1—14" Centrifugal Slurry Pump
- 44,357'—Pipe: Galvanized, Plastic & Cast Iron
- 45—Room Blowers, Brown Fayro & Jeffrey
- 31—Mine Fans from 30" to 9' Hi Pressure
- 17—Battery Chargers, various voltages
- 12—Rock Dusters up to 30 h.p.
- 5—Phillips Machine & Shuttle Car Carriers, 36" to 48" t.g.
- 1—42 Ton Richards Truck Scale, 10' x 25' Deck
- 693—Stationary Motors—½ to 800 h.p., A.C. & D.C. (List of motors available upon request)

We have thousands of dollars worth of parts for the equipment listed.

ALL INQUIRIES WILL BE ANSWERED PROMPTLY—Call, Write or Wire us, day or night

PHONE EITHER OF OUR LOCATIONS FOR FAST RELIABLE SERVICE

WHITESBURG, KENTUCKY

BOX #610, Ph. #2223
NIGHT PHONES—2234 or 2347

BILL CONLEY • MELVIN ADAMS
LEONARD NEASE • JACK FAIRCHILD

CLARKSBURG, WEST VIRGINIA

BOX #227, Ph. #MA 3-0253
NIGHT PHONES—VI 2-2776 or MA 2-6338

HANK UBBING
GORDON STAFFORD

LOOKING FOR AN ECONOMICAL WAY TO MECHANIZE TO MEET TODAY'S RISING MINING COSTS?

Check our listing of modern mechanical equipment — whether to completely mechanize or further mechanize your operation — we offer the most complete stock of used and rebuilt machinery.

BUY — SELL — TRADE

IF WE ADVERTISE IT — WE OWN IT

A.C. MINING EQUIPMENT FOR SALE

- 2—12G-3 Goodman Cutting Machines, A.C.
- 2—11BU-10APH Joy Loading Machines, 220/440 Volts A.C.
- 2—4JCM Joy Continuous Miners, 440 Volts A.C.
- 3—7B Sullivan Cutting Machines, 220/440 Volts A.C.
- 1—T-1 Joy Machine Truck, A.C.
- 1—T2-5 Joy Machine Truck, A.C.

LOADING MACHINES FOR SALE

- 1—18 HR Joy Loading Machine, 250 Volts D.C.
- 4—11 BU-10APE Joy Loading Machines, 250 Volts D.C.
- 1—14 BU-7BE Joy Loading Machine, 250 Volts D.C.
- 1—14 BU-3PE Joy Loading Machines, 250 Volts D.C.
- 6—12 BU-9E Joy Loading Machines, 250 Volts D.C.
- 4—8 BU Joy Loading Machines, 250 Volts D.C.
- 3—7 BU Joy Loading Machines, 250 Volts D.C.
- 2—Long 12" Piggyback Conveyors, each 300' long, complete with PT-12 Piggybacks and 12BU Joy Loading Machines.
- 2—14BU-7RBE Joy Loading Machines, 250 Volts, DC, excellent condition.

SHUTTLE CARS FOR SALE

- 2—32E-16 Joy Shuttle Cars, 250 Volts D.C.
- 1—570-48 Goodman Shuttle Car, 250 Volts D.C.
- 1—5SC Joy Shuttle Car, Elevating Discharge, Disc Brakes, 250 Volts D.C.—Modern.
- 2—6SC-5E Joy Shuttle Cars, Elevating Discharge, 4-Wheel Steering, 250 Volts D.C.
- 3—42E18 Joy Shuttle Cars, Disc Brakes, Elevating Discharge, Completely Modern, 250 Volts, D.C. 2-Standard, 1-Opposite Standard Drive.
- 1—32E16 Joy Shuttle Car, Disc Brakes & Elevating Discharge.
- 2—32 E-7 Joy Shuttle Cars.
- 1—10SC-28PE Joy Shuttle Car, Permissible, equipped with 40J, 15 HP Motors.
- 1—10SC-28PXE Joy Shuttle Car, Permissible, equipped with 40J, 15 HP Motors.
- 4—10SC Joy Shuttle Cars, 500 Volts DC.

CUTTING MACHINES FOR SALE

- 2—29LC Jeffrey Cutting Machines, 250 Volts D.C.
- 1—512 CJ Goodman Cutting Machine, 50 H.P., with bugduster.
- 2—10RU Joy Cutting Machines, 250 Volt D.C. with bugduster.
- 2—29UC Jeffrey Universal Cutters, Permissible, 250 Volts D.C.
- 1—512 CCH Goodman Cutting Machine, 250 Volts D.C.
- 5—35B Jeffrey Cutting Machines, 250 Volts D.C.
- 6—35BB Jeffrey Cutting Machines, 250 Volts D.C.
- 1—512DA Goodman Cutting Machine, 250 Volts D.C.
- 2—7AU Sullivan Cutting Machines, 250 Volts D.C.
- 3—212 AB Goodman Machines.
- 2—412 AA Goodman Machines.
- 1—35L Jeffrey Machine.

CONTINUOUS MINERS FOR SALE

- 2—1CM Joy Continuous Miners, 250 Volts D.C.
- 3—4JCM Continuous Miners, 440 Volts A.C.
- 1—5 JCM Joy Continuous Miner with self-tramming and extensive belt, 440 Volt A.C. complete with 1000 feet of structure and belting with bridge conveyor between miner and belt.

RECTIFIERS FOR SALE

- 1—400 KW American Selenium Rectifier, 4160 Volts Primary, 275 Volts D.C.

ROTARY CONVERTERS FOR SALE

- 1—300 KW Westinghouse, Pedestal Type Converter, 275 Volts D.C., Primary 2300/4000.
- 1—150 KW Rotary Converter, Serial No. 1054562, with 150 KVA transformer and panel boards.
- 1—100 KW General Electric HCC-6 Rotary Converter, 1200 RPM, 2300/4000 Volts Primary, 275 Volts D.C., Pedestal Type.
- 1—150 KW Westinghouse Rotary Converter, Pedestal Type, 1200 RPM, 2300/4000 Volts Primary, 275 Volts D.C.
- 1—200 KW General Electric HCC-6 Rotary Converter, 1200 RPM, 2300/4000 Volts Primary, 275 Volts D.C., Pedestal Type.

COAL DRILLS FOR SALE

- 1—Chicago Pneumatic RBD-30 Roof Drill.
- 25—CP-472 Electric Coal Drills, 250 Volts D.C.
- 5—CP-572 Coal Drills.
- 10—Chicago Pneumatic Little Giant 572 Coal Drills, 3 phase, 220 Volt A.C., permissible, New.
- 4—CP-25 Coal Drills, 250 Volts D.C.

CRUSHERS FOR SALE

- 1—Cedar Rapids 20" x 30" Swing Hammer Crusher.
- 1—36" x 36" Double Roll Crusher, complete with 100 H.P. Motor.
- 1—18" x 30" Double Roll, Double Drive, Scottsdale Crusher.
- 1—Robins 36" x 36" Double Roll Stoker Crusher, specially built with spike teeth equipped with extra set of new segments.

COMPRESSORS FOR SALE

- 1—Joy WK-85 Air Compressor, Serial No. 53661, rubber mounted, self-propelled, 28½" high, Model 240, maximum pressure 100 lbs.
- 2—Acme Self-propelled Air Compressors, 83R, Model 168, Capacity 176CFM, with 40 H.P. Reliance Compound Motor. Excellent Condition.

LOCOMOTIVES FOR SALE

- 1—MH-88 Jeffrey Locomotive, 30" high with CY-21 Reel, 44" track gauge.
- 1—MH-150 Jeffrey Locomotive, 42" track gauge, 250 Volts D.C., 26½" high, rebuilt.
- 1—General Electric 6 Ton Locomotive with Reel, 36" gauge.
- 1—1030 Goodman Locomotive, 24" high, 44" track gauge.

ROCK DUSTERS FOR SALE

- 1—MSA Track Mounted Rock Duster, 10 H.P., A.C. or D.C., high pressure, 30" high, any gauge.
- 2—MSA Bantam Rock Dusters, Rubber Tired, Portable.
- 2—MSA Bantam Rock Dusters, Skid Mounted.
- 1—American Mine Door, Wheel mounted bantam type rock duster, 250 Volts D.C., 22" high.

HOISTS FOR SALE

- 2—Brownie Hoists, 5 H.P., A.C.
- 10—#11½ Vulcan-Denver Material Hoists, Complete with 3 H.P. D.C. Compound Wound 1750 RPM General Electric Motor.
- 1—Brownie Hoist, Model HKW—Good condition.
- 3—Sullivan Type CHL, 5 H.P., Car Spotting Hoists.

ELEVATORS FOR SALE

- 2—Joy PL11-16 Elevating Conveyors.

MACHINE TRUCKS FOR SALE

- 1—T2-5APE Joy Machine Truck, 250 Volts D.C., equipped with hydraulic system for drill.
- 4—T2-5APE Joy Trucks, 250 Volts D.C. Permissible.

CHAIN CONVEYORS FOR SALE

- 5—61AM Jeffrey Chain Conveyors, 10 H.P. 300' long.
- 3—61HG Jeffrey Chain Conveyors, 5 H.P. 40' long.
- 1—Jeffrey 300 ft. 15" Chain Conveyor.

DIESEL PLANTS FOR SALE

- 1—60 KW, G.M. Diesel Generator Set, with 60 KW, 250 Volt D.C. Delco Generator.
- 1—100 KW Waukesha Diesel Generator with 220/440 Volts D.C.
- 1—100 KW Diesel Generator Unit, with G.M. Diesel Engine and 100 KW Generator.
- 1—D13000 Caterpillar Diesel Generator Unit—with Caterpillar engine and 75 KVA G.E. generator self-regulating, 220 Volt A.C.

MOTOR GENERATORS FOR SALE

- 1—150 KW General Electric Motor Generator Set, 2300 Primary, 275 Volts D.C.
- 1—150 KW General Electric Motor Generator Set, 440 Volts A.C. Primary, 275 Volts D.C.
- 1—50 KW Westinghouse MG Set, 440 Volt A.C., 250 Volt D.C.
- 1—300KW Westinghouse Motor Generator Set, synchronous motor, 433 KW Output, 435 KVA, 2200 Volts, 1200 RPM. D.C. generator 300 KW, 275 Volts, 1200 RPM. Compound Wound. Complete with D.C. panel and switch gear.
- 3—50 KW G.E. and Westinghouse Motor Generator Sets, 2300 Volts A.C., 275 Volts D.C. Complete with switching gear.
- 1—200 KW Ridgeway Motor Generator Set, Complete with switchgear and 1600 amp. I-T-E automatic circuit breaker, 2300 A.C., 275 Volts D.C.

BELT CONVEYORS FOR SALE

- 1—Joy 15"—300 ft. Chain Line.
- 300 ft. Joy 15" Pans and Chains.
- 700 ft. Goodman 30", 97C Structure complete with drive.
- 2 only 1200' 26" Belt Conveyors with 30 H.P. 250 Volt D.C. Drives.
- 1—Type 93T24-36 Goodman 500 ft. Rope Belt Conveyor, complete.

ROOF BOLTING MACHINES FOR SALE

- 5—Fletcher Roof Bolting Machines; with permissible dust collectors.

THE FOLLOWING OFFERED AS A PACKAGE UNIT ONLY

- 1—5CM Joy Continuous Miner, 440 Volts A.C.
- 2—16SC Joy Shuttle Cars, matched pair, 440 Volts A.C.

MISCELLANEOUS FOR SALE

- 1—Compton Model 56 Auger with 300 H.P. Cummins Diesel Engine Drive, 210 feet 38" diameter auger (6 sections—35 feet each); 1—42" cutter head, 70 feet, 48" diameter auger (2 sections—35 feet each); 1—52" cutter head.
- 1—300 KVA Underground Transformer, skid mounted, 40" high.
- 3—75 KVA Underground Transformers, skid mounted, 40" high.
- 3—30 KVA Underground Transformers, skid mounted, 40" high.
- 2—3 H.P. Gear Motors with 15" head and tail assemblies.
- 2—5 H.P. Gear Motors with 15" head and tail assemblies.
- 3—75 KVA Transformers, 2300/4000 Wye to 220 Volts.
- 3—35B Jeffrey Armatures, 250 Volts D.C.
- 4—902, 250 Volts D.C. Westinghouse Motor Units, only.
- 1—PL 11-14 Joy Elevator.
- 10—Goodman 512 Cutter Bars and Chains.
- 17—AC&F 42" Gauge, 48" High Drop Bottom Mine Cars. Condition like new.
- 1—24" Fan with drive.
- 2—7½ H.P. Tricycle Type Rubber Tired Mine Tractors, 7½ H.P. 220 Volt Single Phase Motors or 250 Volt D.C. Motors.
- 2—24 J Motors, 7½ H.P., 250 Volt D.C.
- 2—42" Track Gauge Phillips Carriers.
- 1—Manson Mine Jeep 40" Track Gauge equipped with 9J Motor.

ALL EQUIPMENT LISTED AND HUNDREDS OF OTHER ITEMS ARE IN STOCK AND MAY BE INSPECTED AT OUR SHOP AND EQUIPMENT YARD LOCATED AT RALEIGH, WEST VIRGINIA

MOUNTAIN STATE EQUIPMENT COMPANY

Box 1050, Beckley, West Virginia

Phone Clifford 3-7383

J. J. MAHONEY
Res. Phone Clifford 3-6804, Beckley

WILLIAM R. MONK
Res. Phone Clifford 3-6907, Beckley

R. E. KAMM
Res. Phone 4281, Summersville

GIANT SALE!

CONSTRUCTION EQUIPMENT FROM MAMMOTH TRINITY DAM PROJECT

CALIFORNIA

(FOR DELIVERY LATE SEPTEMBER)

*Liquidating \$14,000,000.00 worth of well-maintained,
top name equipment at BARGAIN PRICES!*



CONVEYOR SYSTEM

2 miles long, 42" wide rubber belt. 9 flights, available individually, ranging from 672 ft. long to 1885 ft. long. Braking by electric motors acting as generators under belt load; also mechanical brakes. System includes drive-over hopper loading station for scraper discharge, screening and crushing plant, three drive-under terminal bins with total capacity of 1500 cu. yds.



SHOVELS AND CRANES

2—Model 150B Bucyrus Erie 6 cu. yd. Electric Shovels and Draglines (Note: 8 cu. yd. Dippers w/handles available for above); 1—Model 120B Bucyrus Erie 5 cu. yd. Electric Shovel and Dragline; 1—Model 38B Bucyrus Erie 1½ cu. yd. Shovel, Dragline, Backhoe, diesel; 1—Model 22B Bucyrus Erie ¾ cu. yd. Shovel, Dragline, Backhoe, diesel.



MOTOR PATROLS

9—Model 12 Caterpillar Motor Patrols, 8T, 80D, 70, and 71D Series.



HAULING UNITS

8—Model LRVX Mack Tractors w/ Model 137W Euclid 30 cu. yd. Bottom Dump Trailers powered by NVH-12-B1 Cummins Engines; 10—Model PH95AC International Payhauler Tractors w/Model PW20 30 cu. yd. Athey Bottom Dump Trailers.



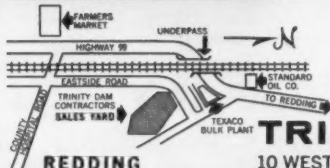
END DUMP EUCLIDS

5—Model 46TD Euclid End Dump Units, 15 cu. yd., powered by Model NHRBIS Cummins Engines; 10—Model 63TD Euclid End Dump Units, 15 cu. yd., powered by Model 6-110 GMC Engines.



LOADERS

1—Model 175ADS Michigan 3 cu. yd. loader powered by Model 135DKBS Waukesha Engine; 1—Model D4 Caterpillar Loader w/ Model EA4 Trackson Loader.



REDDING

All equipment kept in peak condition by elaborate preventive maintenance program. Choose from vast inventory while selection is complete. WRITE, WIRE OR PHONE FOR SALE PRICES OR TO ARRANGE A VISIT TO SALES YARD!

TRINITY DAM CONTRACTORS

A JOINT VENTURE

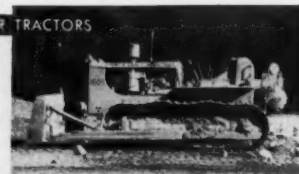
10 WEST ORANGE AVENUE • SOUTH SAN FRANCISCO, CALIF. • PLAZA 6-0300, EXTENSION 279

SALES YARD • REDDING, CALIFORNIA

Eastside Road at South end of Redding
Phone: CHEstnut 1-5241

CRAWLER TRACTORS

15—Model D9 Caterpillar Tractors w/P.C.U.'s and Dozers, 18A Series (Note: 4—Ateco Hydraulic Rippers available for above); 21—Model D8 Caterpillar Tractors w/P.C.U.'s and Dozers, 14A Series (Note: 6—Caterpillar #8 Hydraulic Rippers available for above).



RUBBER TIED TRACTORS

30—Model DW20 Caterpillar Tractors w/Model 456P Modified Scrapers, 67C and 88E Series; 10—Model DW20 Caterpillar Tractors w/Model PW20 Athey Wagons, 88E Series; 2—Model 33LD Euclid Tractors w/Model 32SH Scrapers.



QUARRY DRILLS

1—Model TWM2A Joy Quarry Drill w/T500 Drills, pneu. tires; 3—Model TWM-5 Joy Quarry Drills w/T500 Drills, pneu. tires.



SPRINKLER TRUCKS

1—3400 gal. Model CF523C6 Kenworth powered by Model NRT6B1 Cummins Engine; 1—3400 gal. Model R1F402 International powered by Model NHB Cummins Engine; 1—3600 gal. Model RDF192A International powered by Model JBS600 Cummins Engine; 2—6000 gal. Model 46TD Euclid powered by Model NHRBIS Cummins Engine.



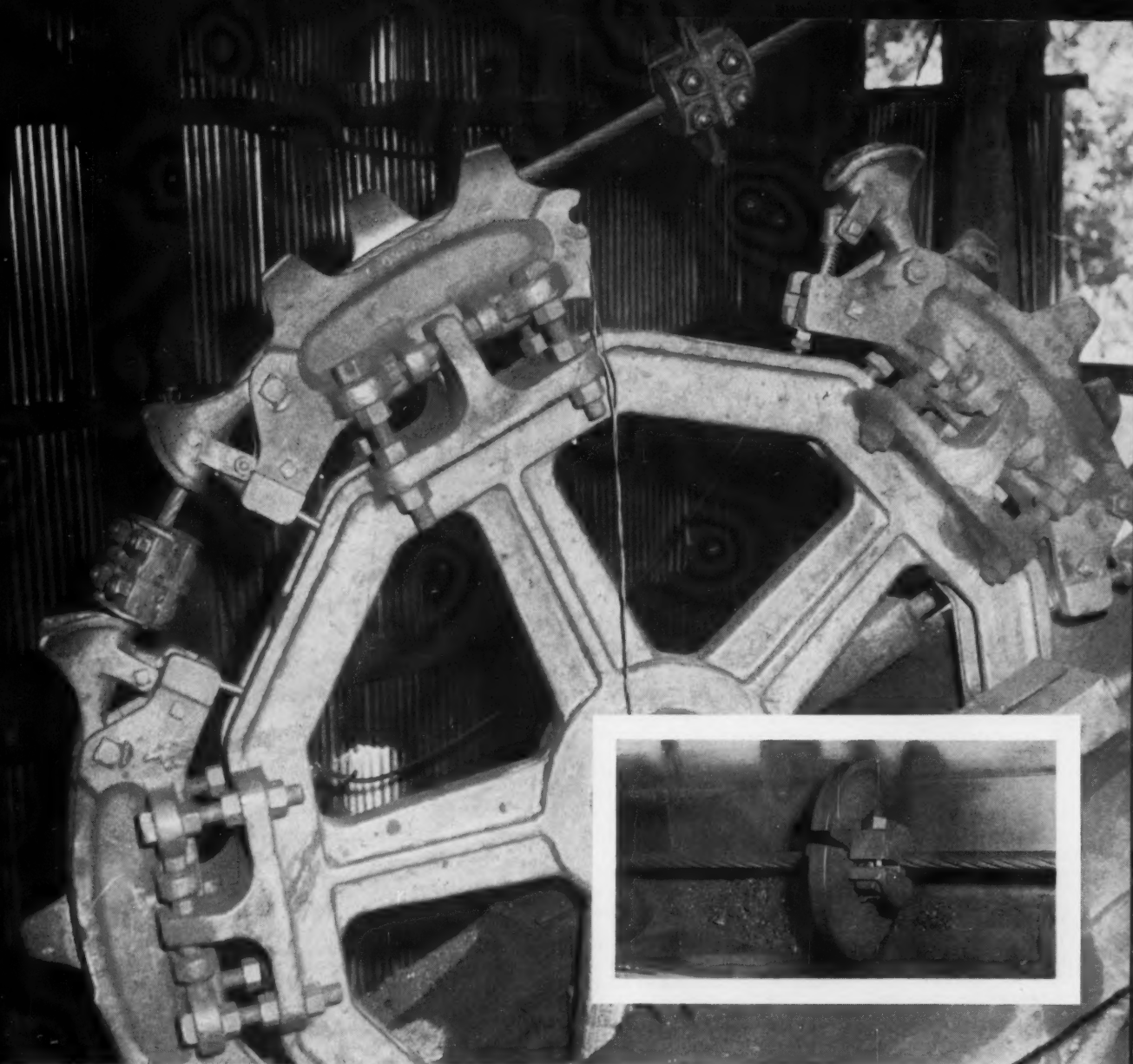
DUMPCRETE

5—4 yd. Dumpcretes mounted on International truck.



ALSO:

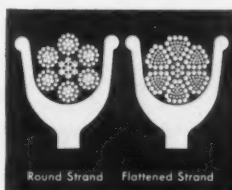
AIR COMPRESSORS • PUMPCRETE MACHINES • BATTERY LOCOMOTIVES • TRUCKS • PICKUPS AND JEEPS • WELDERS • LIGHT PLANTS • HOUSE TRAILERS • PUMPS • AIR TOOLS • ELECTRIC TOOLS • HOSE • PIPE • TANKS AND OTHER EQUIPMENT



40% longer life with Yellow Strand Flattened Strand at V & C Coal Company

After 7 years of abrasion, scuffing, shock loads, and moving 150 tons of coal per hour, Yellow Strand Flattened Strand Wire Rope has amply proved its extra value and long life to V & C Coal Company, Grays Knob, Kentucky. As the unretouched close-up photograph reveals, the rope is still sound, with no strand deformation and very little wear on the outside wires. Previous wire gave 5 years of service—Yellow Strand Flattened Strand is still going strong after 7 years. Button rotation is 46% less than previous ropes used, with very little button slippage.

For complete details on how well Yellow Strand Flattened Strand can serve you, contact your distributor or check with us. Broderick & Bascom Rope Co., 4203 Union Boulevard, St. Louis 15, Missouri.



These illustrations point up the reasons for Yellow Strand Flattened Strand's exceptional service: Each strand is laid up in a triangular pattern. Contact with the sheave groove is made by many wires instead of a few. Note the marked increase in compactness in Flattened Strand, with greater crush-resistance and 10% more metallic area.

Yellow Strand.
FLATTENED STRAND
WIRE ROPE

—ADVERTISERS IN THIS ISSUE—

*Indicates more product information may be found in company advertising appearing in COAL AGE 1960 July Mining Guidebook and Buying Directory Issue. Check your Guidebook index.

*Acme-Hamilton Manufacturing Corp.	149	*Hendrick Manufacturing Co.	141	Standard Oil Co. of Indiana	30-31
*Allegheny Ludlum Steel Corp.	61	*Hercules Powder Co.	148	*Sun Oil Co.	55
*ACF Industries Inc. American Car & Foundry Div.	94	*Heyl & Patterson Inc.	16	*Templeton Kenly & Co.	45
*American Brattice Cloth Co.	150	*Hulburt Oil & Grease Co.	17, 125	Techno Corp.	54
American Hoist & Derrick Co.	43	*International Harvester Co.	156-157	*Texaco Inc.	58
American Manganese Steel Div. American Brake Shoe Co.	18	*Jeffrey Manufacturing Co.	107, 108	*Thermex Metallurgical Inc.	165
*American Oil Co.	49	*Joy Manufacturing Co.	24-25, 51, 168	*Tyler Co. W. S.	Third Cover
*American Pulverizer Co.	106			*United States Rubber Co. (Mechanical Goods Div.)	
American Steel & Wire Div. United States Steel Corp.	14-15, 85	*Kaiser Aluminum & Chemical Corp. 35, 36-37		*United States Steel Corp. (UCO)	46-47
*Anaconda Wire & Cable Co.	132-133	*Kennametal Inc.	70		
*Atlas Powder Co.	20-21	*Lee-Norse Co.	19	*Vaseoloy-Ramet Corp.	53
Austin Powder Co.	57	*LeRoi Div. Westinghouse Air Brake Co. 135		Vulcan Iron Works	170
		*Linatex Co. of America	45		
Barber-Greene Co.	154-155	*Link-Belt Co.	Fourth Cover	Wedge-Wire Corp.	56
*Bethlehem Steel Co.	2, 137, 171	Manhattan Rubber Div. Raybestos-Manhattan Inc.	126	*Westinghouse Electric Corp.	12-13
*Bird Machine Co.	4	Manitowoc Engineering Corp.	163	Wickwire Spencer Steel Div. Colorado Fuel & Iron Corp.	173
*Bixby-Zimmer Engineering Co.	65	*Marion Power Shovel Co.	139	Winslow Government Standard Scale Co. 170	
*Bowditch Co.	87	McGraw-Hill Book Co.	127		
*Broderick & Bascom Rope Co.	181	*McLanahan & Stone Corp.	64		
		*McNally Pittsburg Manufacturing Co.	146	CLASSIFIED ADVERTISING F. J. Eberle, Business Mgr.	
*Caterpillar Tractor Co.	62-63, 184	*Metal Carbides Co.	173	PROFESSIONAL SERVICES	174
*Centrifugal & Mechanical Industries Inc. 150		*Metallurgical Products Div. General Electric	160, 161	EMPLOYMENT OPPORTUNITIES ...	175
*Chicago Pneumatic Tool Co.	143	*Mine Safety Appliances Co.	3	BUSINESS OPPORTUNITIES	175
*Cleveland Wire Cloth & Manufacturing Co. 162		*Mine & Smelter Supply Co.	42	EQUIPMENT (Used or Surplus New) For Sale	175-180
Cross Perforated Metal Plant, National Standard Co.	164				
		*National Malleable & Steel Castings Co. 8			
Davey Compressor Co.	48	*National Mine Service Co.	59		
*Deister Concentrator Co.	60	*Nolan Co.	152		
*Denver Equipment Co.	27	*North American Gear Co.	168		
*Differential Steel Car Co.	40				
*Dowell Div. Dow Chemical Co.	52	*Ohio Brass Co.	6, 33		
*Dravo Corp.	105				
		*Pennsylvania Crusher Div. Bath Iron Works Corp.	153		
*Esso Standard Div. of Humble Oil & Refining Co.	34	*Phelps Dodge Copper Products Corp. ..	29		
Ensign Electric Co.	158	*Pierce Management Corp.	152		
*Exide Industrial Div. Electric Storage Battery Co.	50	*Porter Co. Inc. H. K. Leschen Wire Rope Div.	54, 152, 170		
		Thermoid Div.	147		
*Fairmont Machinery Co.	Second Cover	*Post-Glover Electric Co.	86		
*Federal Mogul Service Div. Federal Mogul-Bower Bearings Inc. ..	41	Prox Co. Frank	42		
*Femco Inc.	151	Reliance Electric & Engineering Co.	95		
*Firestone Tire & Rubber Co.	169	Republic Steel Corp.	166-167		
Flexible Steel Lacing Co.	68	*John A. Roebling's Sons Div. The Colorado Fuel & Iron Corp.	159		
*Flood City Brass & Electric Co.	165	*Rome Cable Co.	183		
Foot Mineral Co.	173	Russell Manufacturing Co.	39		
Galis Electric & Machine Co.	44	*Salem Tool Co.	22-23		
*Goodrich Industrial Products Co. B. F. 1		Searchlight Section	174-180		
*Goodrich Tire Co. Div. B. F. Goodrich Co. 145		SKF Industries Inc.	38		
Great Lakes Steel Corp.	71, 72, 73, 74	*Stamler Corp.	172		
*Gundlach Machine Co.	69				
*Guyan Machinery Co.	162				
*Harnischfeger Corp.	66-67				

ADVERTISING SALES STAFF

Gordon A. Mack, Advertising Sales Manager.

Atlanta 3..... Wm. O. Crank, 1301

Boston 16 R. R. Beckham, McGowan Hill

Bldg., Copley Square. COngress 2-1160

520 N. Michigan Ave., Mohawk 4-5800

Cleveland 13 W. W. Foryslak,
55 Public Square, Superior 1 2660

Dallas 1 John Grant, 1712 Commerce

Denver 2 J. H. Patton, Mayor, Building

1700 Broadway, ALpine 5-2981

Los Angeles 17 P. Carberry, 1125 W. 6th
St., Madison 6-9351

New York 35 .. H. C. Chellson, R. Peckham,

Pittsburgh 32 Wm. H. H. Glinder, 4

Gateway Center, EXpress 1-1314

Plaza, Philadelphia 3. Locust 8-4330

St. Louis 8 P. W. Roets, Continental
Bldg., 3615 Olive St. Jefferson 5-4867

San Francisco 4 J. W. Otterson, 68 Post

Houston 25, Texas F. E. Holland,

Blvd., Jackson 6-1281

Figure 1

United Kingdom Norman Strick

All House 95 Farringdon St., London
E.C.4. Telephone CENTRAL 0911

Austria, Germany, Netherlands Stanley

Germany, Telephone: 772665

land Michael R. Zeynel, 2 Place du

Port, Geneva, Switzerland

Inspection by Jack Brunner can net 28% saving on mine power feeder costs

When Jack Brunner looks over your power supply system, it can mean substantial savings on mine power feeder costs . . .

. . . as much as 28% on some jobs! Jack, a Rome Cable salesman in Pittsburgh, does it with Rome MPT—which he can recommend under certain conditions. Two important requirements Jack looks for before making such a recommendation: relatively steady loads; standard protection against overloading.

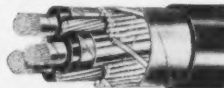
Initial cost is lower than for ordinary mine power feeder cables—as much as 28% in the case of 2 AWG 3-conductor rubber- and neoprene-jacketed 5 kv cable. Compared to these, Rome MPT is smaller in diameter and weighs less, too—easier to handle and install.

Rome MPT lasts longer, too, because the Rolene (polyethylene) insulation and special Ro-seal (flame-retardant polyethylene) jacket combine to give you outstanding resistance to chemicals, moisture, and abrasion.

Ground fault protection is assured by individual copper shielding of power conductors. And bare ground wire—in direct contact with the shielding—provides a low-resistance circuit in the event of ground faulting of equipment.

See your Rome salesman for more information on Rome MPT—or mail the coupon below.

Rome MPT can be used in boreholes, shafts, trays, aerially or underground. Sizes range from 6 AWG to 250,000 CM. A three-conductor cable, it's rated up to 5,000 volts.



◀ **JACK BRUNNER** has been working out of Rome's Pittsburgh office since April, 1958. Prior to coming with Rome, in 1957, Jack served for two years as an electronics instructor at Aberdeen Proving Grounds for the U.S. Army. A degree from Cornell University in mechanical engineering—followed by Rome's extensive training program—qualifies him to intelligently tackle any mine wiring problem you might have. Just call him!

Rome Cable Department 15-90, Rome, N. Y.

- ☐ Please send me a sample of Rome 60 Duplex cable.
☐ I want to "Meet The Man" who can tell me more.

Name

Title Company

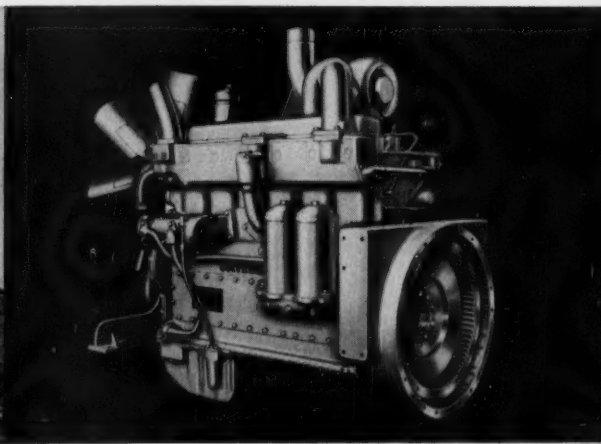
Street

City Zone State



NEW CAT NO. 14 SERIES C MOTOR GRADER

Compact engine plus many other refinements assure top performance, easier servicing, long life



Important changes make up the new Series C No. 14 Motor Grader—big improvements throughout to give you better performance, long life and servicing ease:

NEW COMPACT 150 HP ENGINE The short, rigid block and stress-relieved crankshaft give greater strength and shock resistance. New cylinder head design resists distortion yet has superior cooling characteristics. Large water pump with cast-iron impeller, ceramic seal face, and carbon type seal combined with a 20 per cent increase in radiator capacity improves cooling, lengthens life.

NEW STARTING ENGINE All-weather starting with this new two-cylinder vertical gasoline engine is assured. Replacing the horizontal engine, this design features aluminum pistons and overhead valves for improved performance. Bore is 2.38", stroke is 2.38", and compression ratio is 8:1. Over-running clutch in starter pinion prevents damage to starter engine when diesel starts, a year-round starting plus.

NEW SERVICING EASE An advanced fuel system is designed for easier servicing and more efficient operation. Compact fuel injection pumps with barrel and plunger assemblies enclosed in housing help reduce wear, lengthen service life.

Plus all the features that made the No. 14B the most versatile motor grader in the "big machine" field...

EXCLUSIVE OIL CLUTCH —provides up to 2000 hours of service without adjustment, equal to about a year of "adjustment-free" operation.

DRY-TYPE AIR CLEANER —removes 99.8 per cent of all dirt from intake air. Can be serviced in five minutes.

MECHANICAL CONTROLS —provide easy engagement. "Anti-creep" lock makes blade stay put under load.

FULL VISIBILITY —operator has unobstructed view of job even while seated.

Now, all Cat Motor Graders feature the compact engine. Like the new No. 14C, the 85 HP No. 112E, the 100 HP No. 112F, and the 115 HP No. 12E are all designed to give you the highest production at the lowest possible cost. Your Caterpillar Dealer can give you the facts and figures. He can prove it both on paper and on your job. Call him today.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

**THE NEW NO. 14C
MOTOR GRADER —
MADE FOR THE BIG JOBS**



TYLER service offers 53,000 ways to cut screening costs

To meet all the different requirements for sizing, grading, and separating materials, W. S. Tyler has developed wire cloth in innumerable types, sizes, metals, meshes, and designs. Today, over 53,000 different specifications are available.

Matching the *right* wire cloth to your specific needs is the service provided by your Tyler sales engineer. From Tyler's unequalled range of product he has the know-how and experience to give you results.

That's *Tyler Screening Service*—use it to cut your production costs.

WOVEN WIRE SCREENS • SCREENING MACHINERY
TESTING SIEVE EQUIPMENT

TYLER

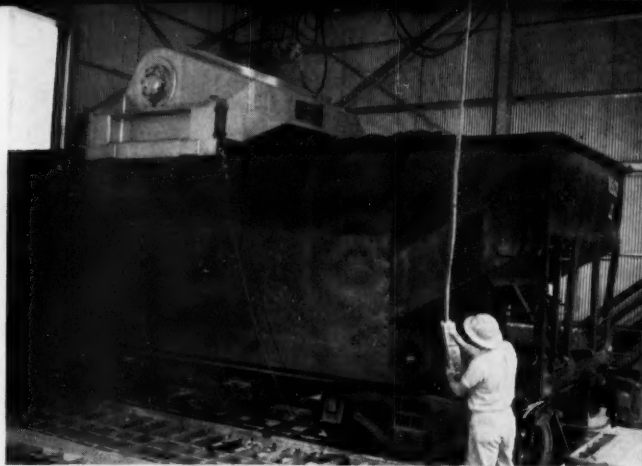
The W. S. TYLER Company • Cleveland 14, Ohio

OFFICES: New York • Chicago • Boston • Philadelphia • Atlanta • Dallas • Los Angeles • San Francisco
Baltimore • Birmingham • Houston • Minneapolis • Pittsburgh • Salt Lake City • The W. S. Tyler Company
of Canada, Limited, St. Catharines, Ontario • OFFICE: Montreal

Small or moderate capacities?

Shake 'em empty!

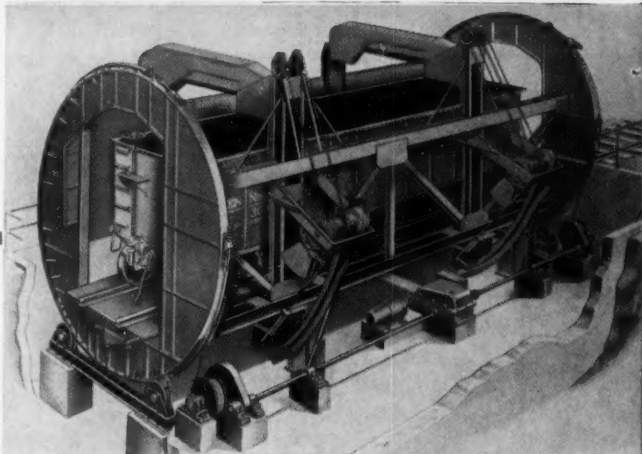
CAR SHAKERS assure rapid, broom-clean unloading of hopper-bottom cars. The Link-Belt car shaker produces a series of solid blows to a long section of the car sides . . . loosening the coal and accelerating its flow. Unloading time for damp, sticky or frozen loads is reduced by car shaker's effective action. Wear to cars is no more than that encountered in normal operation over road bed. And cars need not be uncoupled while the shaker is in operation.



Large capacities?

Roll 'em empty!

ROTARY DUMPERS empty open-top cars of any length, width or height. Full unloading cycle of standard Link-Belt dumpers takes 90 seconds. However, drives can be furnished for cycles as short as 40 seconds. Operation is simple. As rotation begins, transfer table moves sideways until car rests against timbered side frame of cradle. Simultaneously, overhead clamps secure car to rails. Cradle rotates until automatically stopped at the inverted position. Operation is then reversed.



Coal cars empty cleaner, faster, easier with LINK-BELT car shakers and rotary dumpers

IF you receive coal by rail, you'll find the most economical way to unload it is by pushbutton . . . with Link-Belt equipment. A Link-Belt rotary dumper unloads 20 or more cars per hour including normal spotting and handling time. For lower-volume jobs, a Link-Belt car shaker is your best choice. Both are ruggedly built for long, reliable service. Both minimize time and manpower requirements . . . cut costly demurrage charges . . . reduce operational hazards. For complete information, contact your nearest Link-Belt office.

LINK-BELT

CAR SHAKERS AND ROTARY DUMPERS

LINK-BELT COMPANY: Chicago 9, Birmingham 9, Cleveland 20, Denver 2, Detroit 4, Huntington 9, W. Va., Indianapolis 6, Kansas City 8, Mo., Louisville 8, Pittsburgh 13, Seattle 4, St. Louis 1. To Serve Industry There are Link-Belt Plants, Warehouses and District Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World.

15-60

